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Vol. 21. No. 1 JANUARY, 1923

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Entered as second class matter February 10, 1903, at the post-office at New York under the Act of 1879.

A MONTHLY PUBLICATION RELATING TO THE METAL AND PLATING TRADES

SUBSCRIPTION PRICE PER YEAR, UNITED STATES AND CANADA, ONE DOLLAR; OTHER COUNTRIES, TWO DOLLARS. THE METAL INDUSTRY PUBLISHING COMPANY, 99 JOHN STREET, NEW YORK, U. S. A.

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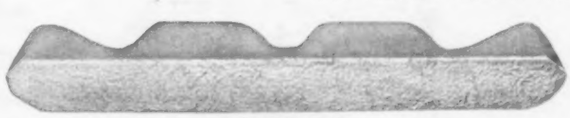

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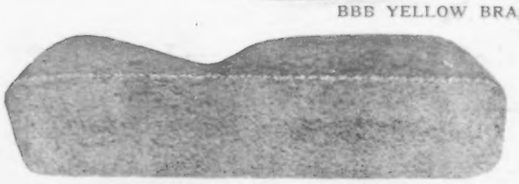

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THE
METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Vol. 21 NEW YORK, JANUARY, 1923 No. 1

Twenty Years in the Metal Industries

A Review of the Successes and Failures in Metal Manufacture as Recorded in the Volumes of The Metal Industry—Also Comments by Experts

By the EDITORIAL STAFF of The Metal Industry

In reviewing the progress of the metal trades since the birth of THE METAL INDUSTRY, January, 1903, one is confronted with the fact that the field of metals is an unusually fertile one. It lends itself easily to new departures. Given ten or a dozen common metals it is possible to build, theoretically at least, an almost unlimited number of mixtures in varying proportions. Moreover, when one adds to this the different types of equipment necessary to produce alloys and fabricated products, the possibilities for variation and differentiation of inventions are beyond calculation.

It is obvious then that with such a broad field in which to operate and only a small amount of money to stand between them and their patents, inventors have run wild in the metal industries. It is, therefore, virtually impossible to attempt to judge their progress by the patent records. Too small a proportion of the patents taken out have had any real effect. Moreover, an attempt to list all the variations in all the different types of machinery required would fill volumes and be very dull reading. It is necessary then for the writers to confine themselves simply to the outstanding inventions which had as their purpose some great change or advance.

Among the specialties in which it is practically impossible to keep up with the numerous variations are the following: Alloys and special mixtures of all sorts, particularly fluxes, deoxidizers, bearing metals, aluminum solders and hardening coppers.

Methods of detinning scrap.

Oil burners.

Cleaning mixtures.

Mechanical plating barrels.

Tumbling barrels.

Grinding and polishing machinery.

It is often said that many meritorious projects fail because they have insufficient backing or improper handling. This is possible, of course, but the chances are that it is rather uncommon. It is quite common for firms which are handling such articles to fail for the above reasons. If an article or an invention has real merit, it is generally taken up by others and eventually pushed to a successful culmination.

EARLY DEVICES

1903—A number of foundry and casting room devices were marketed, such as a **zinc fume recovery system,** but have since disappeared. Conspicuous successes, however, were the **Richards Solder Testing scale** and the **Betts Electrolytic Lead Refining Process.**

Of the open flame furnaces on the market twenty years ago only the **Hawley-Schwartz** remains.

Thomas A. Edison had an invention which consisted of plating nickel on sheet iron, then heating the two to a bright yellow so that the nickel would be welded into the iron and become integral with it. The material could be handled like tin-plate and be stamped, drawn or spun. It was to be used for kitchen ware, cans, dishes, etc., but it seems that, so far at least, this material has made very slight inroads into these fields.

1904—The **Bates-Peard** furnace marked a tremendous advance in annealing. The advance consisted of building a furnace with the annealing chamber sealed by water so that air was excluded. This insured a non-oxidizing atmosphere which permitted the metal to emerge from the furnace as bright as it entered. This furnace is still in operation with some structural changes, of course, but eminently successful.

Aluminum bronze was in its early stages at this period. It had been before the industry for some time but in spite of the general agreement on the fact that it has remarkable properties and can be used to excellent advantage in many places, it has remained in the same position for the past twenty years, comparatively rare as an engineering material. This is, undoubtedly, due to the difficulty in manipulation. So far as we know there are few concerns in the United States turning it out in commercial quantities.

We find a record of a process for making brass castings in metal molds. This has been done many times since, but the problem of making these castings commercial is still unsolved, due to the short life of the molds and the high cost of replacing them.

Sherardizing, invented by Cowper Cowles, was brought out. This process has since become a conspicuous success and has spread all over the world.

1905—The **Steele-Harvey** metal melting furnace was placed on the market. It was a tilting crucible furnace and of a type which is still popular.

Innumerable furnaces were "invented" during that time, most of which have fallen by the wayside.

The J. D. Smith Foundry Supply Company, now out of business, had several to its credit, such as the

American Stoker Melting Furnace, a crucible pit furnace with an automatic stoker arrangement.

Molding machines, sand mixing machinery, polishing machines appeared and disappeared. In many cases inventors had the idea that a slight change would give his machine a great advantage over others on the market. However, few of the machines lived to justify this belief.

1906—A patent is noted on a non-corrosive alloy taken out by A. Monell. This alloy, later known as **Monel** metal, has since spread until it is used in enormous quantities today. Monel is one of the very few alloys which have become standard.

Ajax Plastic Bronze, a copper, lead, tin alloy, with 64% copper, 5% tin, 30% lead and 1% nickel, came out about this time. It has since been widely and successfully used in railroad work, and as a bearing metal generally.

1907—Mention is made of patents assigned to H. H. Doehler for casting under pressure in permanent or metal molds. This was the beginning of **die-casting,** which has since become a great industry. It has been restricted to the lower melting metals, such as aluminum, zinc, tin, lead, etc., but has nevertheless made a most important place for itself in the industrial world.

Core-making machines were invented more than twenty years ago but their real period of development is within this time. They have been one of the most important factors in the development of the foundry industry. Portable pyrometers came out about twenty years ago and since then their use for taking the temperatures of molten metal has grown to great proportions. In fact, no well-run foundry is without them.

An important development in rolling mill machinery, **continuous mill,** is credited to the mill of the Aluminum Company of America, New Kensington, Pa., in 1908. This mill was like every other continuous mill (up to that time used only in the steel industry), in that each stand of rolls was geared to a higher peripheral speed in order to compensate for the increased length and speed of a sheet which has been compressed and consequently lengthened by the preceding roll. It was just the same as if five mills had been put one in front of the other. The Buffalo Copper and Brass Company made a sharp change, about the same time, from the accepted practice in the design of rolling mills by running all its mills with electric power. This principle has since been taken up by practically all the important mills in the country.

Laboratory electric furnaces appeared, of the resistance wire type, and are still on the market.

1908—The **Janitschek** process attempted to revolutionize the casting of bronze and precious metals. This process was simply a variation of the lost wax process, which has, of course, been in use for centuries.

Patents were issued covering **continuous plating** processes which would take material and run it through a bath along a straight line so that it would be completely plated when it left the tank. This principle, namely that of continuous plating, has since been incorporated in several machines which are commercially successful.

A patent was issued to Geo. H. Benjamin and assigned to the Coe Brass Manufacturing Company of Torrington, Conn., which covered the casting of hollow metal bodies in a rotating cylinder. This was undoubtedly one of the forerunners of **centrifugal casting** which is now creating great interest. It has still a long way to go, of course, but it is being used successfully and its use is spreading.

By this time there were probably as many as forty different types of fuel fired brass melting furnaces on the market. How many of these are being sold to-day?

1909—The **Rockey-Eldridge** process for coating iron and steel with copper and brass by pouring or drawing through a bath of molten metal has failed to survive. A **skimming trough** to be used in casting shops which would result in saving the metal usually lost in skimmings was launched, but did not live long.

INTERMEDIATE PERIOD—1910-1915

The first mention in THE METAL INDUSTRY is found of an **electric brass furnace** of the **induction type.** This is one of the earliest of its class. The induction principle has since been widely applied to metal melting furnaces, although this particular furnace, made by the American Electric Furnace Company of New York, was not successful.

The **ampere hour meter** was placed on the market by the Sangamo Electric Company, Springfield, Ill. This device has since found an important field of application and been very successful in the plating industry.

1910—The earliest mention of **Duralumin** was made. That this alloy has become one of the most important non-ferrous mixtures is common knowledge. It has found a most important use in structural shapes for aircraft work.

An **automatic plating machine** appeared, invented by Chas. J. Caley, and was used by Russell & Irwin, Yale & Towne and P. & F. Corbin among others.

Aluminum match plate molding had by this time grown to very large proportions from small beginnings. Also molding machines were becoming more and more popular. **Pyrometers** were increasing in use.

1911—The **Meaker plating machine** appeared and has continued successfully.

The **Hering** electric furnace, the forerunner of the **Ajax-Wyatt** furnace, appeared. The Hering furnace has since proved commercially impracticable, but the Ajax-Wyatt furnace, which appeared on the market several years later, was a tremendous success. Other electric furnaces came out at this time but did not last.

Stellite, an alloy of chromium and cobalt, discovered by Elwood Haynes of Kokomo, Indiana, has since spread very widely in its use.

The plating industry was threatened with several world shaking inventions, among them **Voltite,** a preparation for plating by hand-rubbing the article to be plated. Although it was said that chemically the material was absolutely correct, nevertheless commercially it was a failure. The Cowper Cowles process for **Gold Backing Mirrors** has never been heard from and **Electrochroma,** a method of producing colors by electrodeposition made a great stir for a short time and then evaporated.

1912—Rust proofing processes, which were simply variations of known methods, appeared in large numbers. Some of them continue to be in use to-day, like the **Bontempi.** Others either disappeared in a short time or suffered a lingering death, like **Zi-Led.**

Plating preparations which grew commercially successful included such products as **Trisalyt,** made by the Roessler & Hasslacher Chemical Company, New York, for electro-plating of brass, copper, bronze, silver and gold, and **Oakite,** a cleaning compound made by the Oakley Chemical Company, New York.

Boronized metal, developed by Dr. Weintraub of the General Electric Company, Schenectady, N. Y., was tried successfully. It is still in use, although not general, because of its high cost.

A machine for **manufacturing seamless tubes,** made by Lloyd Manufacturing Company of Menominee, Mich., seems to have had indifferent success, if any.

There seems to have been a tendency around 1912 to 1915 to build melting and annealing furnaces with such attachments as gas producers and regenerators to save fuel. Only in very few cases was this successful, since even where the installation was practical, the cost was so high that it was extremely doubtful if the heat values saved made the saving worth while.

1914—The **Snyder** electric furnace showed its capabilities about this time and has since been useful in a limited way in the non-ferrous field, particularly with high nickel alloys. The Electric Furnace Company of Alliance, Ohio, manufactured one of the early electric annealing furnaces of the **Bailey** type, and along this line they have enjoyed considerable success.

Numerous types of sand blast machinery covering barrel, revolving table, continuous feed cabinet, combined pressure blast cabinet and hose type pressure blast were now on the market.

The **Mellen rod casting machine,** a type of machine which was to cast rod continuously, was written about, and was operated in the plant of the Continuous Casting Corporation, Garwood, N. J., for some time. This concern has been for the past two years in the hands of a receiver.

The Schoop metal spray came out in 1914 under the guidance of the Metals Coating Company of America, Philadelphia, which is still handling the Schoop spray. Although a great deal has been written and said concerning this spray, most of which has been favorable, for some unknown reason it has not made the progress, at least in the United States, which many expected of it.

1915—The **Parker** rust proofing process appeared. The company which backed this process has since bought up the Coslett patents and has continued to operate successfully.

An oil fired **reverberatory furnace** for melting nickel was in use in several plants. The furnace, which was built by the Oil Furnace and Engineering Company of New York, fed its fuel into a flat pan, in which it was lit. The flame was then drawn into the furnace over the metal through a long, narrow opening by means of a draft created by a stack. This furnace seemed to be successful but has not been widely used.

1916—**Hytempite,** a high temperature cement made by the Quigley Furnace Specialties Company of New York, has since been widely and successfully used.

The **Broderick** continuous plating machine, a machine for cleaning continuously and automatically, was taken up by the A. P. Munning & Company, New York, who have continued to make this machine up to the present. By this time plating barrels had become very common; their value being generally recognized. Types and styles, however, were legion.

RECENT PERIOD

1917—The Bureau of Mines announced that its station in Ithaca, N. Y., in charge of H. W. Gillett, had developed a **rocking electric melting furnace** for brass. This was, undoubtedly, one of the most important developments in the history of the brass industry.

The type of furnace developed by the Bureau of Mines has since become the basis of a number of commercial metal melting furnaces, among which are the **Detroit Rocking** and the **Booth.** The **Bailey** also appeared, but it differed from that developed by Gillett, in that it was of the resistor type, while Gillett's was of the induction arc type.

1918—The United States Smelting Furnace Company put out an **oil burning revolving tilting** furnace of the horizontal barrel type.

The **Maxon-Premix** gas burner came out and became very popular. It is still in common use.

A process for tinning both sides of sheet metal was invented by A. H. Wehrle but has created no great stir since.

It is interesting to note that the use of artificial abrasives, which in 1908 had amounted to about only 4,000 tons per year, amounted in 1917 to 50,000 tons.

We have come now to a period which is comparatively close to the present. It is impossible to say whether inventions brought out in 1919 or later are really successful. In some cases they are shown up clearly in a very short time; in others it takes years for the industry to come to a decision.

1919—**Electrically heated ovens** for enameling and core-baking appeared. A new **non-oxidizing annealing furnace** from Charles F. Kenworthy of Waterbury, Conn., the **Booth** and **Detroit Rocking** furnaces and the Ajax-Wyatt induction furnace, all of which have since been successful. An **electric crucible furnace** from the Morgan Crucible Company of Battersea, England, and the **Weeks** electric furnace were brought out but have not been heard from.

An **automatic process for plating copper** on sheet iron, invented by Wm. E. Watkins and operated by the Metals Plating Company of North Elizabeth, N. J., made quite a stir. The **Calorizing** process was begun commercially and has since achieved considerable success.

Nichrome, a heat resisting alloy made by the Driver-Harris Company, Harrison, N. J., also began to spread quite widely.

1920—Important developments consisted of the following: **Heil foot ampere meter** for reading current at any part of the plating tank, made by the Coleman Lamp Company, Wichita, Kansas; **Water Japan,** an emulsion of the asphalt oil base with water, developed by the General Electric Company; **Ajax-Northrup** furnace, a high frequency induction furnace for producing very high temperatures and particularly useful for precious metals. This furnace is operating successfully in a number of installations and it seems that it will go far. A new process for **making 15% phosphor copper,** developed by P. E. Demmler of the Westinghouse Electric Company.

1921—A machine for the **pickling of strip brass** was developed by the Sundh Engineering & Machine Company of Philadelphia, which seems to have the earmarks of a successful device. Electric furnaces, such as the **Von Schlegell** repelling arc type and the **Volta** three-phase type, were placed on the market. The **Belke tank filter,** made by W. E. Belke of Chicago, Ill., appeared, and from all indications is extremely successful.

A process for making metal reflectors, developed by B. Bart, which was said to have been used at one time by the General Electric Company, was backed by the Bart Corporation of New York. This corporation failed, however, due it is said, to insufficient funds and the poor business conditions at the time.

Aluminum silicon alloys began to appear, particularly **Alpax metal,** deveoped by Aladar Pacz. It seems to be the consensus of opinion that these alloys have a brilliant future before them. **Frary metal,** a lead barium calcium alloy, is made by the National Lead Company; **Elektron** metal, a high magnesium alloy, was imported from Germany and **Dow** metal, another of the same type was made in the United States, but how they will fare commercially, it is impossible to state yet. Crucibles made of a **carborundum** mixture are beginning to have considerable use but no accurate data are obtainable comparing them with graphite crucibles in popularity.

Genelite, a synthetic bronze graphite bearing metal, has been put out by the General Electric Company.

Electric furnaces announced are an **induction furnace** from the General Electric Company resembling the Ajax-Wyatt, but said to be an improvement, and the **Hawley** electric furnace, which consists of the body of the Hawley open flame oil burning furnace remodelled to permit insertion of electrodes and the use of an indirect arc.

An **oil burning aluminum furnace,** designed by Edward H. Schwartz of Chicago, was in successful operation.

A new type of **cable draw bench,** made by the Sundh Engineering & Machine Company, combining features invented by August Sundh and W. R. Webster, was placed on the market. The **Udylite Process,** a method of plating cadmium, was launched, as was also **Madsenell nickel,** a malleable electrolytic nickel.

Centrifugal casting seems to be achieving a wider and wider field and to have very broad possibilities. It is fairly safe to say that this process is one of the outstanding features for the future in the metal field.

Commercially, the situation seems to have changed very little throughout the past twenty years, except, of course, that the industry has grown in proportion with the industrial development of the country. The location of the metal industry so far as its most important centers are concerned, have not changed. Connecticut and New York are still the most important centres, but a great increase has taken place in the work done in the Middle West, due undoubtedly to the development of the automobile industry.

The following statement taken from the 1919 census reports shows the states in order of their importance in the metal industries: Connecticut, 35.2%; New York, 13.8%; Michigan, 13%; Pennsylvania, 6.9%; Ohio, 5.8%; Illinois, 5.2%; Wisconsin, 4.7%; Massachusetts, 3.5%, and New Jersey, 3%. These nine states produced 91.1% of the total value of products in 1919.

Advances in the Brass Foundry

Written for The Metal Industry by W. J. REARDON, Foundry Editor

FUEL FURNACES

The improvements have been many, a great many more than I can enumerate. The first big improvement that comes to my mind is the melting of metal. The first furnaces to make their appearance, with any degree of success, were the Charlier furnace, the Schwartz furnace and the Steele-Harvey furnace. All of these furnaces were known as open flame furnaces.

The Charlier furnace was of the horizontal cylinder type, the Steele-Harvey of the vertical cylinder type and the Schwartz furnace of the vertical barrel type. Hundreds of these furnaces were installed after the first ones had been tried out satisfactorily, according to the data obtained by the selling agents.

The Schwartz furnace was used to a great extent in this country and Europe. The fuel used was crude oil or gas. The furnaces were built in sizes ranging from 300 to 6,000 pounds per heat. Unfortunately the Schwartz furnace was never handled properly, from a business point of view, or even better results would have been obtained.

ELECTRIC FURNACES

It had been the dream of the brass foundry to melt by the electric furnace, and all troubles would be eliminated. The electric furnace has made much headway in the foundry within the past ten years, and in my estimation, more success in the brass mills, some of which melt practically all their metal by the electric furnace. In the foundry, I cannot safely say the electric furnace is a vast improvement over the open flame furnace, when properly handled. I will say, however, they are improving. I have known of cases that when metal of high quality was desired, the open furnace was used in preference to the electric furnace. I speak now of hydraulic work, where castings are subjected to pressure testing. I could go into details as regards the merits of the furnaces, but I am only reviewing the improvements.

ALUMINUM MELTING

In America as well as in Europe the greatest advance has been made in the aluminum foundry. The melting of aluminum in iron pots seems to have made the greatest progress. Personally I could never see the advantage of melting in iron pots and I attribute the greatest share of the losses in the aluminum foundry to the melting in iron pots. The method is wasteful and sloppy, and very few more heats can be taken of an iron pot than a crucible. If a heat of brass is first taken out of a crucible before melting aluminum, as many heats can be taken out of a crucible, with a properly regulated furnace, as can be taken with an iron pot. I predict the iron pot will disappear within the next few years for melting aluminum.

The field is open for the electric furnace and oil furnace combined; also the new style open flame gas furnace which is another invention of Edward Schwartz.* Several of these furnaces are in operation and are said to be giving complete satisfaction.

CORE MAKING

The next subject that comes to my mind is core making. Ever since the earliest day it has been necessary to make cores. Of late years we have had the benefit of several ingenious machines for core making. My first recollection was a foot power jarring machine which made round, square and oval cores. When making as many as one dozen cores at one time, the operator was enabled to rod and then vent after ramming with one operation to each part to rod, and then vent the entire dozen cores with one movement. The outfit was simple and cheap.

With the introduction of the worm machine, where round cores from ¼" to 6" in diameter are turned out as fast as they can be carried away, the sand is fed into a hopper and the core is forced out through a tube.

We also have the small hand ramming roll-over core machines which are used extensively in large foundries. Then we have the multiple core box that has done so much for the brass plumbing and fitting foundry. I have seen one girl operator make 20,000 one half inch cores in a 10-hour working day. The method is as follows: Sixteen cores are made in one box. The core sand used is a sharp sand tempered with oil. No wire or rods are used and the cores are dried in the box they are made in. No handling of the cores is required. A core conveyor runs right by the hand of the core maker and the cores are conveyed to the core oven where they are dried and the core box returned to the core maker after the cores are taken out and inspected and packed for the foundry.

In my estimation the greatest invention the brass foundry has today is the automatic core machine. In the June edition of THE METAL INDUSTRY, 1915, I described this machine fully. Since that time the inventor has made considerable improvement in the machine and is now blowing globe valve bodies, a very difficult core to make.

*See THE METAL INDUSTRY, November, 1922, P. 444.

Advances in Mechanical Methods

Written for The Metal Industry by PETER W. BLAIR, Mechanical Editor

DIE CASTING AND FORGING.

The machine die-casting process has become of great value to the metal working industry as it has brought about great savings in machining operations. Products are easily nickel-plated, high rate of production is obtainable and all holes can be accurately cast in the work.

Brass forgings have become very popular and are developing in manufacture for the past ten years. It is simply a process by which the small billet of the desired weight for the article is heated to a high temperature in this state, it is put into steel dies and pressed to the shape of the die. By learning the exact weight required, a blank billet, although far from the desired shape, can be forced into quite complicated designs which would be difficult to mold or cast in the foundry, and which requires no machining. The pressing will close all pores and by the use of aluminum in the mixture, high tensile strength can be procured.

AUTOMATIC MACHINING

Great advancement has been made in labor saving machine tools by the universal use of the automatic and semi-automatic screw and chucking machines; the adoption of up-to-date tools and equipment for the production of high quality work. Threads accurate in form and pitch are made by the use of self-opening die heads and collapsing taps.

In cutting threads high speed tapping devices are now used either on a vertical or horizontal position and drill presses are now used for threading. If the work is to be hollow milled, or some other operation performed upon it, slip collets can be used in connection with the tapping device and a hole drilled, reamed, counterbored and tapped without moving the work or stopping the machine. Figure 1 shows outside thread cut on a drill press. Figure 2 shows a drill press set up for threading studs. The same device and equipment is used on both jobs.

PRESS WORK

Press work has developed considerably in the past and side presses are now blanking as well as drawing and embossing automobile hub caps at the rate of 900 per hour for each operation. Whether you wish to emboss a tiny trade mark on a delicate mechanism or a large and complicated design on a heavy sheet metal part it is now done rapidly on a press. The demand for press work is constantly increasing and new tools are being developed and product produced that could not be successfully handled in the past. In future years we shall see further important developments both in the processes and in tool equipment that can be used for the production of finished products from the different styles of punch presses.

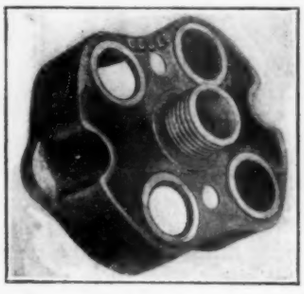


FIG. 1—THREAD CUT ON A DRILL PRESS

AUTOGENOUS WELDING

The process of fusing and uniting metals by the application of intense heat without compression or the use of a flux is termed "autogenous welding." There has been great progress along this line in the past twenty years and it is now in universal use and extending to new fields every year. The temperature required is obtained by the combustion of a mixture of gases, such as oxygen and acetylene or oxygen and hydrogen.

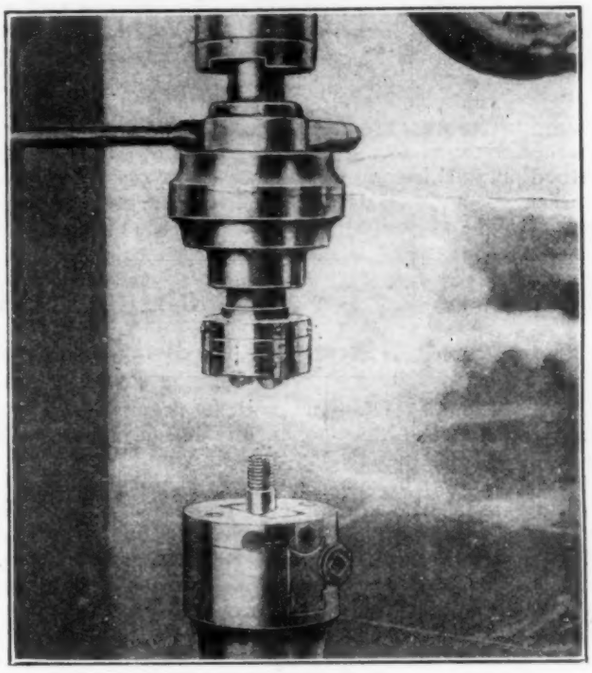


FIG. 2—DRILL PRESS SET UP FOR DRILLING STUDS

One or both of these gases are under pressure which can be regulated to get the desired low or high pressure with a regulating valve and gauge on the tank. The gases are mixed in the nozzle of the torch prior to combustion. Ordinarily the weld is made or formed by fusing in additional material between the surfaces of the joint. This material is in the form of a rod or wire and may or may not be of the same composition as the material being welded. The proper size of tip to use for welding depends upon the thickness of the work and the rate at which the heat is dissipated. Sometimes the rate of conduction and radiation is affected by the location of the parts to be welded. In general, heavy parts will conduct the heat more rapidly from the working point, and to offset this loss of heat, a larger tip is used. In any case the tip should be as small as is compatible with good work to economize in the use of gases. If the flame is too small for the thickness of metal being welded the heat will radiate almost as fast as produced, hence the flame will have to be held so long at one point to effect a weld that the metal will be burned. On the other hand, if the flame is too large, the radiation may be insufficient to prevent burning the molten metal.

WELDING ALUMINUM

Aluminum has come into such universal use in the past twenty years that acetylene welding is an important item. Aluminum that is to be welded should be scraped and cleaned and if the stock is more than ¼ inch thick, it is advisable to chamfer the edges. The oxy-acetylene flame can be reduced or softened by using an excess of acetylene to a degree which will be indicated by the extension of the acetylene cone from 1 to 1½ inches beyond the white cone. This excess of acetylene does not injure aluminum

but lowers the flame temperature which is desirable when welding aluminum. Many aluminum parts can be welded without pre-heating, such as lugs or projecting pieces broken off completely.

WELDING BRASS

For welding brass hold the point of the white flame slightly away from the weld according to the thickness of the piece so that the heat will not be sufficient to burn the copper in the brass or volatilize the zinc. A little borax should be used as a flux.

SAVING DEFECTIVE CASTINGS

Castings in brass are now salvaged that previously were remelted as scrap owing to blow-holes and porosity. The method pursued is to preheat the casting to a temperature between 200 and 400 degrees F. below the melting point or to a bright red color. Have some of the metal melted in a crucible ready to pour, then apply the torch to the blow-holes to be filled and when the walls of the casting are fused by the flame, continue mixing the poured metal with the molten metal of the walls until the hole is completely filled.

In welding copper the same practice is followed as in brass. Copper will weld at about 1930 degrees F. Hence the flame does not have to be at so high a temperature as steel, and it must not be concentrated on so small a surface. Copper conducts heat rapidly so it requires a large quantity of heat.

The oxy-hydrogen and oxy-acetylene flame are especially adapted to cutting metals and are now in practical use for cutting up large brass castings and copper tanks which were always a labor problem with foundrymen, for example, screw propeller blades to be remelted or large risers and sprues on castings.

Rolling Mill Development

Written for The Metal Industry by W. J. PETTIS, Rolling Mill Expert

A new year makes its bow, with its promise of a new deal all around. New hopes awakened, old sorrows buried, and some merely confirmed.

The act is an old one and doesn't get the hand from its audience, as a whole, that it is really worth. But it finds that small part who "live, move and have their being" in the brass rolling mill industry, sitting up in their seats and wondering how 1923 will finish its act in the great brass making scene.

The last few years have brought about more revolutionary changes in the industry than the preceding century, though many of the mechanical changes owe their birth to many years of costly experiments, and the winning over of the conservatives, who after all are the firm foundation and safeguard of any industry, and act as a brake on the pioneer of new ideas, often an irritating one, but they force him to produce his best and prove it.

THE PASSING OF SECRETS

For some years past a broader spirit has been injected into the industry and the freer exchange of views on the merits of different methods employed in the different factories, has been helpful in developing new ideas and creating new methods of operation. To many old timers the free exchange of views spelled disloyalty to the factory in which you were employed. Thirty years ago, when the labor turnover was not the problem it is today, a man might boast of the amount of metal he rolled or cast, but he would not divulge the details of the operation to his best friend, if he was employed in a rival factory. It was a fine spirit of loyalty, but "splendid isolation" at least in the industrial world does not make for the rapid development of ideas.

The bars that were the heritage of a conservatism, born of what for years was a highly localized industry, are being moved away, and this movement has been given added impetus by a new force that has joined hands with the brass manufacturers, and promises to point the way to new achievements, both commercially and in the production of the finished material.

CHANGE IN MEN

Not the least change has been in the character of the men employed. In the casting shop at that time the nationalities mostly employed were English, Scotch, Welsh and Irish. They were all of hardy stock and well fitted for the tremendous physical toll their work demanded of them. A crew of three men on a set of fires was the usual thing, running a slightly smaller pot than is used today. The caster weighed out his charges, carried them to the fires, and usually broke his spelter for the rounds. The fireman and mold man worked on a co-operative basis, helping each other out and, at the end of the day's run, after punching out the fires took a wheel barrow, removed the ashes from under the fires, they washed up and then went out and spent a pleasant evening.

There was no place for the weakling, and the man who could not do his bit received more contempt than pity.

The caster, in addition to weighing out his charges, helped his mould man pull every pot, skimmed it, cooled it back to a proper pouring heat, and poured it. He also was the last word in supplying a remedy for any complaint from a customer regarding the quality of brass he was receiving. He would gravely listen to the complaint, examine the sample submitted, with equal gravity, and oracle-like give his judgment from which there was no appeal, though ofttimes the remedy submitted was a surprising one. In one case the manager, who was also owner of the plant, brought both a complaint and a sample to substantiate it to his boss caster. The caster listened to the complaint and considered it trifling. He examined the sample and decided it was good, and said, "You tell him (the customer) to go to Hell. There ain't any better brass made in this country." As competition wasn't very keen in those days there was probably some little merit in the remedy.

CASTERS' "TRICKS"

Among the many "secret" ways of improving the quality of the brass was to boil it. If the customer was using a two and one brass, i. e., 66 2-3 copper-33 1-3 zinc, and it failed to meet the stress of a special heavy drawing or spinning operation, the caster was instructed to get out a sample that would stand up. He would weigh out the same charge, two and one, and the operation would go along in the usual way until after the pot was "speltered." when the caster would wave away the helpers, take charge of that pot, and start the "secret stuff" which was to boil it. Then the pot was pulled and cooled back and poured. It eventually reached the customer and met the heavy stress he put on it. The caster was complimented and looked upon as a wizard, the customer was pleased, and the manager proud that he had so much talent on the pay roll.

What actually happened was that the pot of metal was superheated to a point where the zinc loss was excessive, and instead of a bar of brass with a copper content of 66 per cent it was nearer 70 per cent and stood the greater punishment the customer gave it. But its added virtue was laid to the door of the special treatment it received with no knowledge of any excessive loss. It must be remembered that the chemist was an unknown quantity in the brass mills of that time and the casters had to meet and work out their own problems, unaided by any technical skill, and with but little help from their fellow craftsmen; for not only was the number of skilled casters a comparatively small one but each man carefully guarded his hard-won knowledge. His earning power made him an aristocrat among men who worked with their hands, and the young man who had a chance to learn the art under a good caster was looked on as one of fortune's real favorites.

Some years later, but still at a time when the American citizen was free and sinful, a bartender who was employed in a saloon that was a gathering place for most of the casters in town, told me that he knew more ways of making good brass than any man in the world, and no two of them alike. It would appear that in those "high moments" that Mr. Volstead has made impossible, the casters dropped their professional reserve and told each other about it. Each man had his special method of treating his melts and contradictory opinions regarding the relative advantages of slight changes in these methods. But they did wonderful work considering the handicaps they worked under and laid down principles that are sound today.

MORE HELP FOR THE CASTER

As the years went on many refinements in the practice were introduced, and resulted in a more uniform quality of metal and great economies in handling the raw material. The size of the crucible was increased and "sets" of fires were built that reduced the melting time per round. The caster had become a more temperamental artisan than his predecessor, and declined to do much of the grilling work performed by the former. The casting crew (helpers) consisted of four men, two firemen and two mold men; they would turn out about ten thousand pounds of castings per day of eight hours. The metal was weighed and delivered to the casting shop, and each melting unit in a separate iron box, and the ashes were taken out from under the fires by laborers appointed to that work. On the whole the job compared to the older practice was "not so bad."

The laboratory had become a valuable and necessary part of the casting shop, and the caster with his larger opportunities of studying the technical side of his work became a highly efficient man. But fundamentally it was the same old operation, with the personal element and the weather so closely interwoven in the product as to make scientific control impossible, and make it equally impossible to produce a strictly uniform quality of high grade brass in large quantities. Many variables still remained to be contended with. While it was generally conceded that the fast fires made the best metal, assuming that you had a crew that could keep up with them, there was hardly a casting shop that didn't have "sets" of fires with varying meltings; speeds, depending on their location to the stack; the slow ones were simply accepted with resignation.

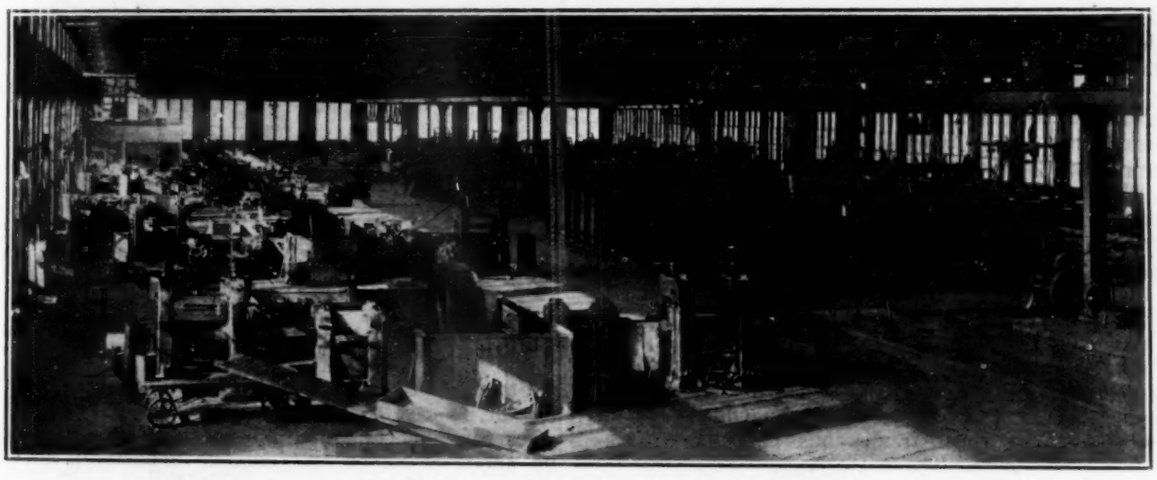
The personnel of the crews changed. The bulk of the helpers were Lithuanians, Poles and Russians; many of our colored citizens took up this work and made good. The casters were generally native sons, some following in the footsteps of their fathers, but each year the recruits from among the American born boy for this work is growing less.

ELECTRIC MELTING

The last two years have witnessed the adoption of electricity as a melting element by the big producers, and while there is still much to be desired it has revolutionized that branch of the industry and has placed it under proper control, holding out sure promise for still greater things.

MECHANICAL EQUIPMENT

In the rolling mills the mechanical working of the brass has been steadily improved. Old methods and old equipment are being discarded for new and better ways. Rolls have been speeded up, new stands of rolls have been installed, with stronger housings, and the diameter of the rolls increased in order to get a bigger per cent of reduction on the brass bars, in fewer passes, without breaking up the equipment. Tandem rolls are being used, resulting in a bigger output at a smaller cost.



LAYOUT OF A TYPICAL UP-TO-DATE MILL

At the finishing end hardened steel rolls are used in place of the chilled iron roll. This increases the output, as less time is lost in grinding, the roll having much harder surface. A chilled iron roll shows a hardness of 60 to 70 and a steel roll 95 to 105 scleroscope test.

The overhauling of the metal is now done in milling machines instead of the old scratch machines. Automatic blockers take the metal as it leaves the rolls and place it on the spool, an operation formerly done by hand, and calling for a dexterity that approached slight of hand. It involved great risk, many of the operators suffering the loss of a hand or arm by getting caught between the metal and the spool.

RESEARCH

Probably the greatest benefit to the trade is the increased knowledge the rolling mills have gained through their research departments of the affects of annealing temperature on the crystalline structure of the brass, just what form would meet the customers' need, and the ability to reproduce it accurately in large quantities.

For years the annealing temprature was judged by the eye of the furnace man in charge of the work. Today the annealing muffles are under pyrometer control. Many improvements have been made in muffle construction, by the builders, to meet the demand for more accurate heat control.

There is an old rule of thumb method of approximating the possible production of a rolling mill. Two decades ago it was put at 50,000 pounds per roll per month, of gauges covering the general commercial demand. Today it is put at 70,000 pounds per roll and with a much larger percentage of light gauge metal being used.

STANDARDIZATION

The men at the head of the new movement, among other things hope to standardize the copper zinc and copper zinc lead alloys. Many of the mills are handling as many as fifty different alloys with such slight variation in the content as to be of no practical value. By grouping these alloys and getting in proper touch with the customer, it is hoped that a small fraction of the alloys now in use will cover the field.

The 1923 show will be an interesting one.

Twenty Years in the Electro-Plating Industry

Written for The Metal Industry by CHARLES H. PROCTOR, Plating-Chemical Editor

EARLY DAYS

For many years previous to the year 1888, the plating industry had made but slow progress. Yet each year had shown a greater production of electro-plated goods. Practically all types of solutions, with one or two exceptions, were being used in the production of substantially the same electro-plates and chemical finishes that we see on every hand in the retail shops today. Hardware was being finished in an endless variety of finishes. The incandescent light had not yet become universally used in our home life, so gas and kerosene were still the basic factors for giving light. Therefore the production of lamps in endless variety by manufacturers in New England brought the skill of the old-time plater into action, which resulted in an endless variety of beautiful finishes that have never been surpassed. The old time plater knew his business. There are a few of them left who can still teach the present chemist or chemist electro-plater something about the art of electro-plating and finishing of metals even though he may presume to be the old-time plater's master.

It is regrettable that a recent article in the THE METAL INDUSTRY on "Electro-Plating—Its Past, Present and Future," its author should have cast reflections upon the old-time plater, discredit his knowledge and ability. It was the old-time plater of thirty or forty years ago or even more, who made the electro-plating industry, when men of scientific training had experimented with the art as a toy. The old-time plater, through his persistency, through his untiring efforts, through love of his chosen profession, made it an art as well as a commercial industry that today is of tremendous importance.

ELECTRICAL EQUIPMENT

The event of new types of dynamo electric machines, especially the Eddy dynamo made in Windsor Lock, Conn., gave the necessary current at 5 to 6 volts to enable the plater to deposit brass or bronze or other metals in a much shorter time than previously possible. The Eddy dynamo supplanted the Weston and other similar types of dynamos. It was permanent in its current generation. The previous types of generators had caused the plater endless trouble. He never knew when the polarity of the dynamo would reverse and many times in the writer's experience, he found that instead of the work being satisfactorily plated, the metal had become reduced from the articles, due to change in polarity. In the case of nickel-plating brass goods, the polished base surface was entirely destroyed by the resulting contamination of the nickel solution from the copper and zinc so reduced in solution. The only electrical controlling instrument was a galvanometer that enabled one to determine at a glance when the polarity of the dynamo had changed by the deflection of the steel hand upon the dial of the galvanometer. External resistance that controlled the current passing into the bath during the plating operations was accomplished by copper, brass and steel wire of various diameters. These methods are still in vogue, but with more scientific instruments for both voltage and amperage measurement, and modern rheostats.

MASS PRODUCTION

The ever-increasing size of modern generators with their tremendous output in current capacity has been one of the great factors in the development of mechanical plating. Great mechanical units with solution tank capacity of 12,000 gallons, with electro-cleansing and electro-pickling, with the various washing operations before delivering 14,000 zinc-plated steel automobile rims every twenty-four hours, completely finished, from the removal of the heavy greases to the final drying out of the rims, would not have been possible twenty years ago, with the limited facilities in the platers' hands. Yet the modern developments of mechanical plating and electrical control have made such results possible. Under such conditions of control the plater can eliminate guess work, and produce deposits of metal to meet any requirements without rule of thumb methods, if his employer will purchase such controlling instruments for him.

STANDARDIZED SOLUTIONS

Standardized methods of replenishing the solutions each day or, in case of necessity, twice a day, from standard stock solutions containing all the factors necessary to keep up anode reduction and cathode deposition, as well as solution deterioration have accomplished wonders for the plater whose daily output is counted in tons. Under such methods of standardized control, it is not necessary to be an expert chemist to be a successful plater. Only the simple methods of solution analysis as applied to electro-plating, are required, so far as chemistry is concerned.

AMERICAN ELECTRO-PLATERS' SOCIETY

The advent of the American Electro-Platers' Society has been of immeasurable benefit to the electro-plater and the industry at large. It has eliminated the myths and the secrets of electro-plating of many years ago. It is still growing in strength and value to the plating industry. The war gave a great impetus to the plating industry, both in production and standardization, and the methods developed are still valuable. The last twenty years have produced wonderful results, and the next twenty years should be even greater.

The Year's Progress in Metals

Annual Review of the Progress Made in Metals, Their Alloys, and Their Application to the Industrial Arts—Part 1 .

Compiled for The Metal Industry by R. E. SEARCH, Exchange Research Editor

PART I. METALS AND ALLOYS

ALUMINUM AND ITS ALLOYS

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Alloys of Cerium with phase diagrams. R. E. Search, Met. Ind. *20*, pp. 142-44. Also in Rev. d. Met. *19*, pp. 352-58 by Leon Guillet, who concludes that under the circumstances studied, cerium may be considered as a dangerous final addition to an alloy, as the excess required for a complete refining of the metal remains in the alloy in the state of a compound, and still, certain alloys of cerium may have a certain interest as an ingredient of anti-friction metals because of the presence of the numerous compounds which it forms.

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Constitution of Aluminum Alloys containing Cu. Mg. and Si. and their age hardening. Marie L. V. Gayler. Met. Ind. *20*, p. 383.

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PART II

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(This review will be concluded in an early issue.—Ed.)

Dial Copper and 12% Watch Nickel

An Article Describing the Manufacture of These Products From the Raw Material to the Finished Product—Part 1*

By WILLIAM B. PRICE, Chief Chemist and Metallurgist, Scovill Manufacturing Company, Waterbury, Conn.

HISTORICAL

Examination of the ruins of prehistoric times indicates that copper, on account of the ease with which it could be smelted, refined and worked, was the first metal to be utilized by man.

The earliest records show that copper was first refined by the Egyptians about 4,000 B.C., and came from the Sinai Peninsula.

SOURCES

Copper is a widely distributed metal. The three principal sources of copper are:

(a) Sulphide ores.

(b) Native copper which is only found in large amounts in the Lake Superior region in Michigan.

(c) Oxide ores.

METALLURGY

The copper is then extracted from these ores by fire, hydro- or electro-metallurgical process, or by combinations of these.

The products of these leaching and smelting operations are known as blister, black copper and refined copper, the last from native lake ores. These are then either fire or electrolytically refined and remelted.

REFINING

The fire refining of copper consists in an oxidizing fusion in a reverberatory furnace (melting, fining, or rabbling), which volatilizes some impurities (sulphur, zinc, lead, arsenic, antimony), and scorifies others (manganese, iron, lead, nickel, cobalt, bismuth, arsenic, antimony). The slags are skimmed and fining continued until about 6 per cent of cuprous oxide (Cu_2O) is held in solution. The oxide is then almost, but not entirely, reduced by poling; that is, the introduction through the furnace door of a green wood pole into the molten metal. About 0.04 to 0.05 per cent oxygen (0.45 to 0.56 per cent Cu_2O) is generally left in the copper to prevent the reduction of the oxides of arsenic, antimony, etc., to the metallic state in which they would again dissolve in the copper.

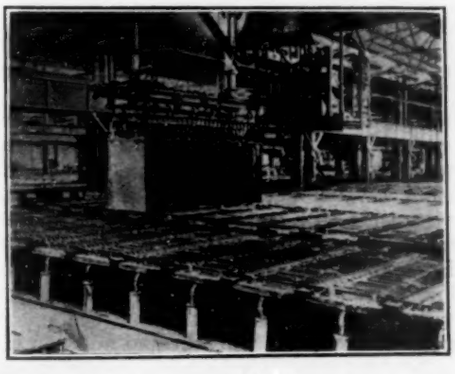


PLATE 1—LIFTING CATHODES FROM ELECTROLYTIC TANK

In electrolytic refining, the blister or raw copper is cast into anodes, about 36 by 36 by 1 inch in dimensions. These are dissolved by the aid of the (direct) electric current in a solution of sulphuric acid and copper sulphate and redeposited in the same operation on cathode sheets. Plate 1, shows lifting cathodes out of electrolytic tank.

The cathodes as so produced, although very pure, are not mechanically suitable for commercial use, and are remelted into wire bars, slabs, ingots, etc. This is done in a large reverberatory furnace, in the same manner as was described under fire refining. Plates 2 and 3 show

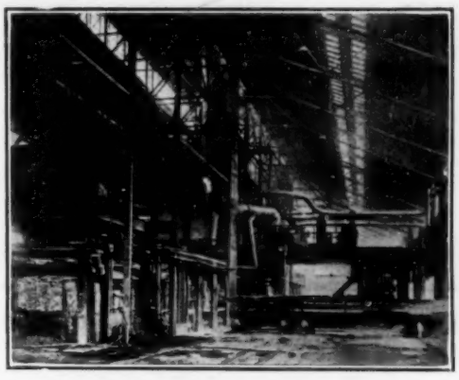


PLATE 2—CHARGING SIDE OF REFINING FURNACE

charging and casting sides of a large refining furnace.

COMMERCIAL GRADES

There are three well known grades of copper produced in the United States,—Lake Copper, Electrolytic Copper, and Casting Copper.

The grade used by the Scovill Manufacturing Company for the production of dial copper is Electrolytic Copper, which has been electrolytically refined from blister, converter, black or lake copper.

PLATE 3—CASTING SIDE OF REFINING FURNACE

METALLOGRAPHY

Cathode copper, containing 99.98 per cent copper, is the purest copper produced commercially by electrodeposition and not remelted. Its structure consists of groups of crystals which are regular in form.

Plate 4 shows the structure of cathode copper. Please note the intercrystalline voids existing in this material. This explains why cathode copper cannot be used directly but has to be melted and cast into ingots and bars.

When the copper cathodes are remelted they take up

*An address delivered before the Foreman's Association, Waltham Watch Company.

oxygen, only part of which is removed by poling, so that about 0.05 per cent of oxygen remains in the cast ingots from the furnace. (The microstructure of cast slabs as it leaves the refinery is shown in Plate 5, Fig. 1, shows the structure of the upper section of the slab. You will observe that the top of the bar contains considerable cuprous oxide.) The center of the bar shown in Fig. II. shows

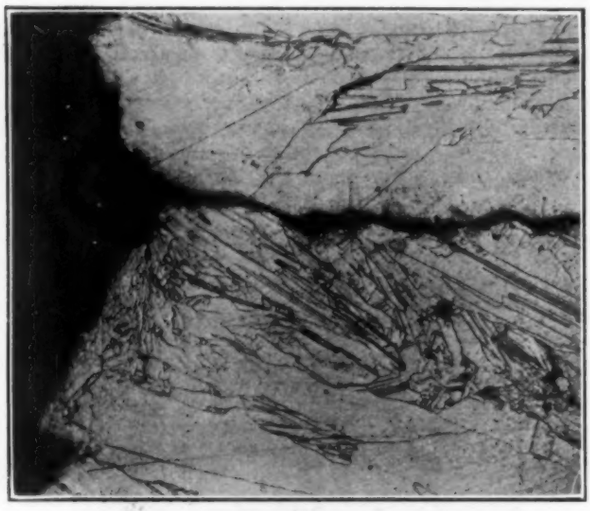


PLATE 4—MICROSTRUCTURE OF CATHODE COPPER
75 ×. Etch $NH_4OH+H_2O_2$

comparatively little oxide, but is more or less shot with gas holes. The bottom section of the bar also contains comparatively little oxide, as is illustrated in Fig. III.

The oxygen present is combined with copper in the form of Cu_2O and form a eutectic with copper of the com-

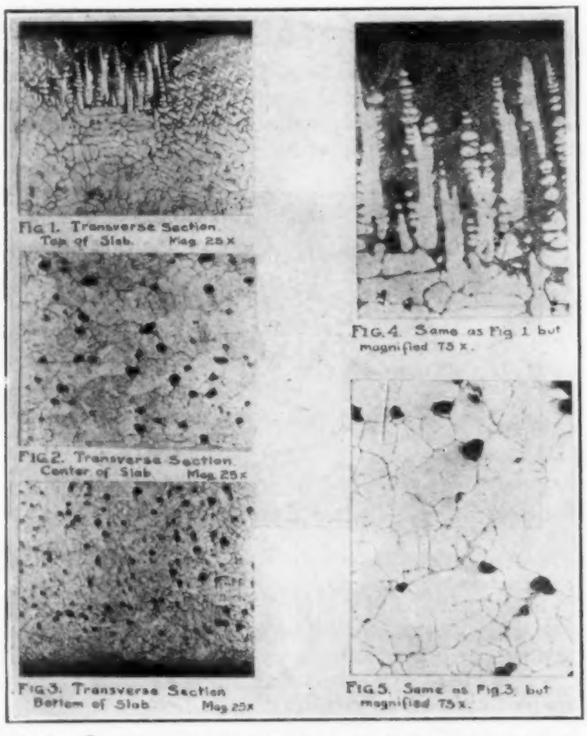


Fig.1. Transverse Section Top of Slab. Mag. 25x
Fig.2. Transverse Section Center of Slab. Mag. 25x
Fig.3. Transverse Section Bottom of Slab. Mag. 25x
Fig.4. Same as Fig. 1 but magnified 75 x.
Fig.5. Same as Fig.3. but magnified 75 x.

PLATE 5—MICROSTRUCTURE OF A CAST COPPER SLAB
25 × and 75 ×. Etch $NH_4OH+H_2O_2$

position 3.45 per cent Cu_2O. It melts at 1063° C., the melting point of pure copper being 1083° C. Under the microscope it has a robin's egg blue appearance, with a red "glow" at the center of each particle.

COMMERCIAL SHAPES

The remelted copper cathodes are cast into ingots, wire bars, slabs, square and circular cakes and billets. The different shapes are shown in Plate 6.

The size and weight of these bars vary greatly, depending on the size of the finished product. Those used for the production of dial copper are in the form of slabs, and

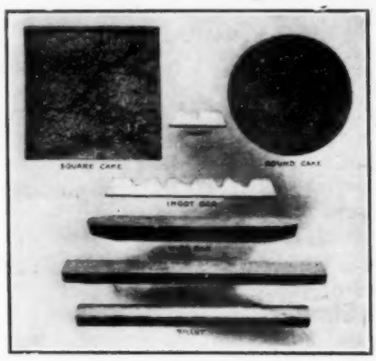


PLATE 6—CAST COPPER SHAPES

are about 48 inches long, from 3½ to 6 inches wide, and weigh from 135 to 200 lbs.

HOT ROLLING

The slabs are heated in a bar heating furnace to the required temperature and then hot rolled at 900 to 1000° C. A number of passes are necessary to bring the bar to the required thickness of ½ inch. If the hot rolling is performed at the proper temperature, the round gas holes will weld and the resulting bar becomes sound.

The finished sheet is black with the oxidation caused by exposure of the hot copper to the air during the rolling operation. In addition to this surface oxidation, the sheet still retains the oxide from the top of the original slab. This oxide together with other defects incident to hot rolling, are removed by our special process which leaves the bar clean and ready for cold rolling.

Other methods of producing dial copper are used in which this precaution is not taken.

If the defects are not removed before cold rolling they will later produce hard spots, dirt spills, and segregated oxide areas, elongated by rolling which will result in defective dials in the enameling.

This article will be continued in an early issue.—Ed.

Why Enameled Ware Cracks

Bureau of Standards finds it is because enamel does not "fit" the iron.

Enameled iron utensils for household use are supposed to be foolproof. It should be possible to leave them on a hot stove for awhile and then to pour cold water in without causing any damage. It has long been known that this was possible with some makes, but that others when so treated would crack, and the enamel would chip off.

The Bureau of Standards has recently been conducting tests to find the cause of this cracking, and has found that it occurs because the enamel does not "fit" the iron.

All substances expand when heated and contract when cooled, when the rate of expansion is the same for the enamel as it is for the iron then they will stay together through any amount of heating and cooling, but if they have different rates of expansion they are likely to separate.

The rate of expansion of the enamel depends upon its composition, and may thus be adjusted quite accurately to that of the iron. The Bureau expects shortly to publish a paper dealing with this subject and advising manufacturers of enameled ware what composition will give the best "fit."

White Metals

A Review of the Principal Classes of White Metals, Their Composition and Physical Properties, Chiefly in Relation to Their Uses and Manufacture.—Part 1*

By A. H. MUNDEY, C. C. BISSETT and J. CARTLAND

INTRODUCTION

The family of white metals is a very large one, and although a great deal of investigatory work has been carried out in connection with it, the amount of attention it has received, compared with that accorded to the alloys of which copper is the chief constituent, is very small indeed. Probably it is for this reason that the manufacture of white metals, particularly of those chiefly composed of tin, antimony, and lead, has been regarded as a business with many so-called trade secrets. This latter condition no longer obtains, as it is obvious that the only secret is that which is the result of patient investigation, and the exercise of the highest skill and experience available.

For practical purposes alloys which are generally described as white metals may be classified as follows:

1. Anti-friction or bearing metals;
2. Printers' metals;
3. Pewters and Britannia metal;
4. Solders;
5. Special alloys used for castings for chemical works, building services, battery plates, bullets, collapsible tubes;
6. Die-casting metals; and
7. Toy and mould metals.

PART I

ANTI-FRICTION ALLOYS

The introduction of white metals for lining bearings is not an old one, and is probably the outcome of the suggestion, attributed to Hopkins, to use lead for this purpose.

The exact physical properties required in a lining for a bearing are not exactly agreed upon. It is generally admitted that in the ideal journal the shaft never comes in contact with the bearing at all, the metallic surfaces being completely separated by a film of oil. This condition would at first sight appear to render the particular material of the bearing a matter of small importance, but it will be shown later that the material of the bearing itself plays an important part in the maintenance of the oil film. As the ideal conditions are impossible of practical attainment, it becomes a matter of serious moment to provide a metal for the bearing which will meet the mechanical conditions imposed, as well as present the kind of surface which will promote the spreading and maintenance of the oil film.

Engineers demand a certain balance of properties in a bearing. It must be sufficiently hard and strong to resist distortion under working loads and irregular stresses. It must present a fine surface, not liable to rapid abrasion, and on the other hand must have a measure of plasticity which will permit it to accommodate itself to slight want of alignment of shafting, and it must be sufficiently tough to resist fracture under shock.

Experience has established the opinion that a homogeneous metal is not suitable for a bearing, that neither a single metal nor an alloy which is a solid solution can be employed with success, and that either a metal consisting of a soft matrix with hard crystals embedded in it, or a hard metal interspersed with veins of a softer constituent, has the necessary surface for a practical bearing alloy. There can be little doubt that the best service is obtained from an alloy which, though wanting in homogeneity, has its undissolved constituents distributed in a regular and uniform manner. The authors are of opinion that this mottled surface, in which the harder portions are in slight relief, provides a number of pools and canals which serve to retain the oil film, and, on account of their fine and even distribution, promote the spreading of the oil over the surface by a function which is closely related to capillarity.

As it is generally useful for the engineer or other user of bearings to visualize the properties of metals employed, in quantitative terms, the usual tests for tensile strength, hardness, and compression have been made on representative alloys. The test-pieces were prepared by casting into a cast-iron stick mold under uniform conditions. The temperature of casting was about 350° C., the mold being heated to approximately 100° C. The acting portion of the test-piece was 0.564 in. in diameter, the length being 2 in., according to the usual formula $L = 4\sqrt{\text{area}}$. The Brinell tests were all taken with a 10-mm. ball at a uniform load of 500 kg. These standard conditions were used because the average engineer is familiar with them, and can think in terms of the results so obtained.

The compression tests were made by taking cylinders 0.564 in. diam. × 0.5 in. high. The first observation was made when a permanent deformation of 0.001 in. was produced, the ultimate figures when the test-piece was compressed to one-half its original height.

The choice of a bearing metal is often controlled by consideration of first cost, and this feature is probably responsible for many disappointments and troubles. Tin being the most expensive constituent of the usual white bearing metals, the proportion of tin mainly affects the price.

For the highest-powered engine bearings for automobile, aero, and similar services, the following alloys may be looked upon as good representative types:

1. TIN, 93 PER CENT; ANTIMONY, 3.5 PER CENT; COPPER, 3.5 PER CENT

This alloy, which is quite free from lead, combines maximum toughness with strength. This metal was mostly favored in aero-engines throughout the war, and gave generally excellent results. It is probably ideal for big-end bearings.

The microstructure shown in Fig. 1 (Plate I.) is characteristic. The antimony is below the 7 per cent necessary for the formation of the cuboid crystals of the antimony-tin compound, the antimony forming a solid solution with the tin. The structure shows very plainly the ε copper-tin constituent.

Tensile Test		Brinell Hardness Number	Compression Test. Tons per Sq. In.	
Tons per Sq. In.	Elongation per Cent. on 2 In.	10-mm. Ball, 500 kg.	Yield Point, 0.001 In.	Compressed to Half Length
5.12	11.6	24.9	3.569	14.732

*A paper presented at a meeting of the British Institute of Metals, September 20-22, 1922, and at Swansea, England.

2. TIN, 86 PER CENT; ANTIMONY, 10.5 PER CENT; COPPER, 3.5 PER CENT

This is also a lead-free alloy, harder than No. 1, owing to the presence of a higher percentage of antimony. It has, however, a useful degree of toughness.

Tensile Test		Brinell Hardness Number	Compression Test. Tons per Sq. In.	
Tons per Sq. In.	Elongation per Cent. on 2 In.	10-mm. Ball, 500 kg.	Yield Point, 0.001 In.	Compressed to Half Length
6.65	7.1	33.3	4.372	17.232

This alloy is very useful for general work for main bearings. In constitution it is very different to No. 1, as seen by its microstructure (Fig. 3, Plate I.); in this

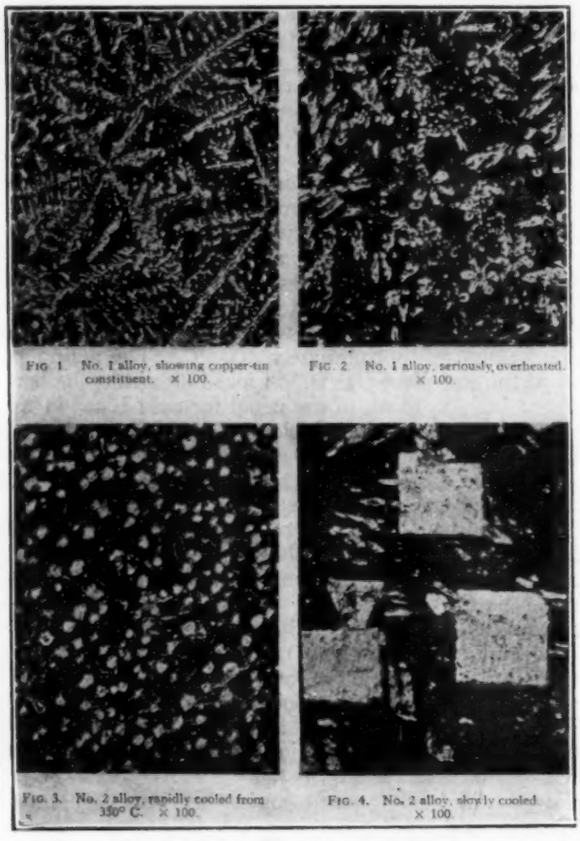


FIG. 1. No. 1 alloy, showing copper-tin constituent. × 100.

FIG. 2. No. 1 alloy, seriously overheated. × 100.

FIG. 3. No. 2 alloy, rapidly cooled from 350° C. × 100.

FIG. 4. No. 2 alloy, slowly cooled. × 100.

PLATE 1. MICROSTRUCTURE OF HIGH GRADE BABBITT

the antimony-tin cuboid crystals are well developed, as are also the copper-tin needle-shaped crystals. This shows, in a very striking manner, the influence of the two sets of crystal constituents as specially noted in Hudson and Darley's work, the copper-tin separating out and forming on solidification a lace-like material throughout the otherwise fluid metal at about 252° C., and entangling and enmeshing the antimony-tin cuboid crystals, which solidify at 238° C. The authors consider that this is perhaps the most important function of copper in a tin-base anti-friction metal. The cuboid γ crystals of tin-antimony are lighter than the eutectic matrix, and would therefore segregate rapidly to the surface if they were not held in position immediately on formation by the previously formed dendritic copper-tin ϵ constituent. Thus, if the cooling be reasonably rapid and regular, an even distribution of the hard constituents, upon which the whole value of the metal depends, is secured.

Figs. 3 and 4 (Plate I.) show the great difference in size and distribution of crystal constituents when rapidly or slowly cooled. The alloy represented in Fig. 3 was cast at 350° and cooled instantly; that in Fig. 4 was cast at 350° and was two hours cooling. Both are of exactly the same composition and of the same magnification. The result of overheating metal of this description may be seen by examination of Figs. 2 and 5. Here the copper-tin constituent loses its value in a great measure, as the crystals when cooled from a high temperature do not form the lace-like structure, but are in the form of single ill-formed needles, and lack the valuable property of assisting in the even distribution of the tin-antimony cuboid crystals. The presence of a small quantity of lead in these alloys is of no great detriment if the even distribution of the constituents, which has been already emphasized, is insisted upon. Thus, the following alloy—

3. TIN, 83 PER CENT; ANTIMONY, 10.5 PER CENT; COPPER, 2.5 PER CENT; LEAD, 4 PER CENT.

gave upon test:

Tensile Test		Brinell Hardness Number	Compression Test. Tons per Sq. In.	
Tons per Sq. In.	Elongation per Cent. on 2 In.	10-mm. Ball, 500 kg.	Yield Point, 0.001 In.	Compressed to Half Length
5.6	None	34.5	4.284	17.640

It will be seen that the lead appears to cause the disappearance of any useful elongation, but the tensile test fails to show all we need in this case, for it is the experience of engineers that this particular alloy is excellent in its resistance to shock.

The so-called Babbitt metals are legion; the following may be regarded as fairly representative. Their real value depends not by any means only upon their actual percentage composition, but upon the care in preparing and melting, ensuring even distribution of the constituents.

4. TIN, 80 PER CENT; ANTIMONY, 11 PER CENT; COPPER, 3 PER CENT; LEAD, 6 PER CENT

Tensile Test		Brinell Hardness Number	Compression Test. Tons per Sq. In.	
Tons per Sq. In.	Elongation per Cent. on 2 In.	10-mm. Ball, 500 kg.	Yield Point, 0.001 In.	Compressed to Half Length
5.7	None	32.1	4.64	17.500

Very useful for heavy loads and high speeds: Diesel engines, turbines, rolling-mills, locomotives.

5. TIN, 60 PER CENT; ANTIMONY, 10 PER CENT; COPPER, 1.5 PER CENT; LEAD, 28.5 PER CENT

Tensile Test		Brinell Hardness Number	Compression Test. Tons per Sq. In.	
Tons per Sq. In.	Elongation per Cent. on 2 In.	10-mm. Ball, 500 kg.	Yield Point, 0.001 In.	Compressed to Half Length
5.04	None	27.1	3.696	12.856

For internal combustion engines of all types, steam-engines, dynamos, locomotives, etc.

6. TIN, 40 PER CENT; ANTIMONY, 10 PER CENT; COPPER, 1.5 PER CENT; LEAD, 48.5 PER CENT

Tensile Test		Brinell Hardness Number	Compression Test. Tons per Sq. In.	
Tons per Sq. In.	Elongation per Cent. on 2 In.	10-mm. Ball, 500 kg.	Yield Point, 0.001 In.	Compressed to Half Length
4.58	None	21.8	3.660	11.284

A generally useful alloy for heavy pressure and medium speed or medium pressure and high speed: automobile engines, railway and tramway bearings.

7. TIN, 20 PER CENT; ANTIMONY, 15 PER CENT; COPPER, 1.5 PER CENT; LEAD, 63.5 PER CENT

Tensile Test		Brinell Hardness Number	Compression Test. Tons per Sq. In.	
Tons per Sq. In.	Elongation per Cent. on 2 In.	10-mm. Ball, 500 kg.	Yield Point, 0.001 In.	Compressed to Half Length
5.48	None	31.3	4.016	12.212

This is also a useful metal for medium pressures and speed, or light pressure and high speed.

This paper will be continued in an early issue.—Ed.

New Brooms Sweep Clean

Wrecking Crews Working in Relays Eventually Sweep Old Established Concerns Out of Business

Written for The Metal Industry by WILLIAM H. PARRY, Foundryman

When in the course of human events a firm decides that its executive force has outlived its usefulness, and an infusion of new blood is needed to save the business, it is not too far fetched to state that in many such instances the beginning of the end is in sight. Admitting that the old crew of executives had slowed up due to the ravages of time, it does not always follow that the new force is any improvement over those they succeeded, in fact, the reverse is more apt to be true. If there is anything more sad in the business world than to witness the total disruption of an old established manufacturing business by men hired for the express purpose of rejuvenating it, we have yet to record the fact.

In one instance, that of a most successful iron foundry located on Manhattan Island, New York City, the three sons of the original owner had decided among themselves that their father's methods were too ancient, and had invited him to take a back seat, while they proposed to run the business in an up-to-date manner. In a sense this action of theirs was a laudable one, and on the surface appeared to promise results. But the personal equation entered here as in all similar cases, and the business was wrecked because none of the three sons was fit to manage a peanut stand.

One of the sons did his little best to surround in his own person, a prodigious amount of whiskey and died in the attempt. Another was a fop, whose chief outdoor sport was to parade up and down Fifth avenue, New York, trying to outrival E. Berry Wall, then known as the "King of the Dudes." The third did make what to him was an honest attempt to manage the business, but as he wore a very high collar, long shirt cuffs, spats, and kid gloves, while roaming around the foundry which was not famous for its cleanliness, he was regarded as a harmless boob by his own men, with the result that the efficiency of the plant went to the dogs, thus losing its prestige and later its very existence.

Another case presents itself; that of a manufacturing plant whose specialty was metal goods. The business had grown in a steady and healthy manner, which covered a period of over thirty years. The executive force had remained practically intact for this long period, when suddenly the president decided that the factory executive force needed some shaking up. He appointed a "purchasing agent" whose chief duties seemed to be to visit the factory in the mornings, and report his findings to the president in the afternoons. While at first there was no objection on the part of the factory executives to this newcomer, there developed among them in time a decided antipathy to his methods, in that, when news or happenings were scarce at the factory, he did not hesitate to fill the void from his own imagination, with the inevitable result of a break in executive ranks by the resignation of the superintendent.

His twenty-nine years service of the most loyal kind were forgotten when the purse proud old president accepted his resignation, and appointed two men to fill his place, one an "insider" and one an "outsider." The "insider" was a joke from the first go-off, and cut no figure whatever in subsequent events, but the "outsider" with the able assistance of the so-called purchasing agent certainly did start something at that factory.

First of all, he sneered at the equipment, jigs, fixtures and the rank and file. He proceeded with all possible despatch to replace them all with his friends from Medicine Hat or Painted Post or other such outlandish tank towns. They were a peculiar lot of men, whose knowledge of manufacturing machinery must have been acquired while repairing wheel-barrows or some such complicated mechanisms used on farms, as their talk and walk indicated their extremely rural origin.

Well, by golly, this new "super" was a bird, and no mistake. He ordered material with the prodigality of a Croesus and the sense of a drunken sailor; high speed tool steel by the ton, and gray iron castings by the barge load. His idea of efficiency of all machine tools was to crowd them beyond their capacity to stand up to this kind of treatment, which in the end ruined all of them. Yet this "worldbeater" lasted between two and three years before they caught on to his pitiful ignorance of all things that go to make a successful executive.

He was followed by an Ole Olsen "who ban one gude Swede" with a record acquired in the middle West, as one son-of-a-gun of a hustler. His tactics were pretty much the same as those of his predecessor, except that he was not slow to catch on that speed at the expense of accuracy of product was not wanted at that plant.

This gave him ample time to perfect himself in the gentle art of snuff eating, at which he became very competent indeed. It fitted him to be numbered as among those present at the time of the demise of the company, which strange to say, followed the demise of its president insofar as being an actual producer was concerned.

One of the weaknesses of both of these men was the scrapping of valuable jigs and fixtures that they could find no use for, until an order would come for the parts for which they were designed, then there was nothing to it but to make them the best they knew how regardless of expense.

The third case of this kind is a sad, sad story because of one organized band of business wreckers whose achievements prior to their taking up the total destruction of a concern was heralded far and wide as being as neat a bit of mismanagement as could possibly be. The concern in question had been very successful and was paying handsome dividends to its stockholders some of whom depended entirely on the income derived from this source. The wreckers lost no time in inducing the powers that be to enter another field, for which they were ill equipped, with the old, old story as a consequence, that of a receiver winding up its affairs, and their careers in that town at least.

So that it is well for any company to give very serious thought before throwing out the old force and putting on the new in the hope that conditions will improve.

Distribution of Brass Manufactures

A daily paper, the New Haven "Register," for December 17, 1922, states that 65 per cent of all the brass in the world is made in Connecticut.

With all due respect to Connecticut, which is the unquestioned leader in this industry, this is an exaggeration. According to figures from the last census Connecticut reported 35.2 per cent of the total value of products produced in the United States. A list of states producing 3 per cent or more will be found on page 4 of this issue.

Shrinkage vs. Cold Shorting

A Discussion About These Causes for Defective Castings as Applied to a Particular Instance

By A. W. CASH, Foundryman, and W. J. REARDON, Foundry Editor, The Metal Industry

THE DIFFICULTY

Q.—I am sending you today by parcel post a brass casting of body part of an ordinary carbonic acid gas regulating valve in which you will note that the inlet nozzle portion on the inside is broken out where it was faced and tapped, the metal showing a very short or brash condition. This is due I believe to gas pocket and cold short action at the time the metal flowed into the dead end.

You will note by the parting seams, that the body was cast on the side, the gate for the metal being at the end of the inlet nozzle, and it appears to me that the metal flowing in through the gate under a considerable head pressure first partially fills the dead ended inlet nozzle part, but does not completely fill it until the remaining body portion of the casting is nearly filled, and by this time the metal in the dead ended inlet nozzle has had time to partially cool off so that when the full weight of the metal in the body portion forces additional metal into the inlet nozzle part, the metal near the dead end has cooled to such an extent that it becomes brackish or brittle near the extreme end with the result that it breaks away very easily when being machined.

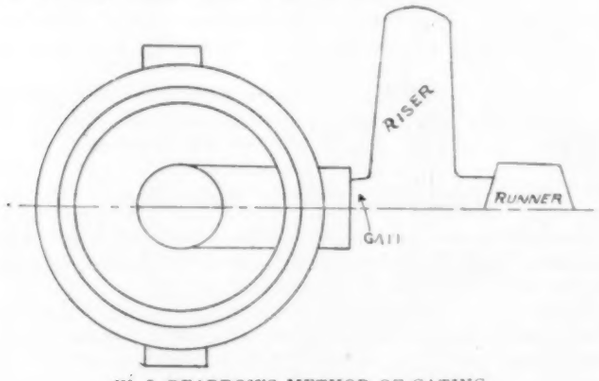
Out of about 1,000 castings made, over 50 per cent show this bad condition of the metal and it appears to me that the matter should be remedied effectively by extending the dead ended portion of the inlet nozzle in the form of a small rod say ¼ inch diameter through the core to the opposite side of the valve body shell in such manner that the metal would flow through the inlet nozzle into the opposite side of the shell thereby keeping the metal hot until the whole mold was completely filled.

The composition of the metal from which these castings were made is 87.12 copper, 5.45 tin, 1.98 lead, 5.45 zinc.

I will very much appreciate if you will have your metal and foundry expert examine the sample casting carefully and advise me at your earliest opportunity if my analysis of the difficulty is probably correct, and if not what in his opinion is the real cause of the difficulty.

THE REMEDY

A.—I received the sample casting and after examining the casting, am of the opinion that the trouble of the metal breaking out where it is faced and tapped is due to shrinkage cracks and is caused by the light section cooling first and pulling from the heavy section.



W. J. REARDON'S METHOD OF GATING

The remedy in this case is to gate the casting as per inclosed sketch. Make the gate so as to feed the casting when cooling. You will note the feeder that is attached to the pouring gate so as to supply hot metal to the inlet nozzle as the casting cools.

Also would suggest that the core be made so that the metal will not jump or kick when the casting is poured. This will show in the gate. The gate should show a shrinkage after pouring at the pouring sprue. The composition of the metal is a mixture that should stand up very well under any working conditions in machining.

I feel the trouble is caused by shrinkage cracks or cold metal. The pouring temperature of such a mixture should be approximately 2,000 to 2,100 degrees Fahrenheit. Suggest that you add about a teaspoonful of salt just before pouring. Stir well, and with the gate made as per inclosed sketch, you should have no further trouble.—W. J. REARDON.

A DIFFERENT REMEDY

Referring to your letter together with your report from your expert on cracked casting submitted for information, would say that I advised the inquirer of the cause of the difficulty after having made a very careful study of the trouble experienced by him.

I have been engaged in pattern and foundry work as regards the molding and pouring proposition for the past thirty years, and must say that I am indeed very much surprised at the report of your expert. I am very sure that your expert either has had no experience whatever in such matters or else he did not thoroughly examine the casting and study the matter out, as the crack on the tail end of the inlet nipple on the body away from the pouring gate is such that it could not possibly have been caused from a shrinkage strain as reported by your expert. It is entirely evident to even the merest tyro in such matters that the crack or rather breaking away of the metal while being machined was caused by cold shorting, that is a portion of the metal running into the dead end and lying there for a little period until the balance of the form was filled up allowed the first portion of the metal to cool to such an extent that it did not thoroughly unite in a homogeneous mass after the mold had become filled.

I believe in your own interests that you should either have your expert go over the matter carefully again, or else would seriously advise you to consult someone else.

Please understand that I am not writing this in a spirit of criticism but solely for the purpose of the best interest of all concerned, and I will appreciate an acknowledgement from you together with any other information which you may have.—A. W. CASH.

MR. REARDON'S REPLY

For the information of Mr. Cash I will explain how I arrived at my conclusion. The casting was cut in two and put under the glass in looking for cold shorting. The metal was clean and of open grain. That showed that the trouble was caused by improper feeding or the metal becoming disturbed when it came in contact with the core. I could not say how this was caused, but in my opinion it was caused by the light section cooling and pulling from the gate which was not large enough to feed, and weakened the metal to such an extent that the tensile strength was impaired, and also the elongation.

If Mr. Cash wishes to prove this theory he should make two test bars, one with large enough gate or riser to feed, and the other with a small gate, and then pull these two pieces and note the results. I cannot agree with Mr. Cash in his idea that the trouble was caused by cold shorting.

If this was the case the casting would show a defective fracture where broken off, but the sample casting showed clean, clear, open grain metal.

If Mr. Cash still has trouble with this casting I would suggest that he give the gate I suggest a trial and then advise us of the results. Even though it is caused by the core, this gate will help overcome any little disturbance by the force of metal behind the gate.

MR. CASH'S REPLY

I thank you for your letter of the 10th inst. relative to casting submitted sometimes since for a report, and also thank you for copy of report from your expert.

Your expert must indeed have had a very poor glass if he could not see evidence of cold shorting in the sample because the two surfaces where they came together without firmly uniting were quite plainly clean surfaces and without any evidences of shrinkage whatever; in fact there was not the remotest evidence in the casting whatever of any shrinkage, and I feel that I am capable of judging in this matter from the fact that I have had over thirty-five years experience in making and gating patterns and in manufacturing castings therefrom in iron, steel, brass, aluminum, monel metal, etc.

Confirming me still further is the fact that at the same time I sent you a sample for report, I sent an exact duplicate of the casting to a large metal concern with headquarters in St. Louis and requested a report from their expert, and while he differed with me slightly as to the best method of gating and pouring the casting, he did agree with my conclusion that it was due solely to cold shortage and that there was no evidence whatever of shrinkage in any part of the casting where there might have been shrinkage, but the merest tyro in such matters should know that shrinkage could not occur on the tip end of an internal piece where the trouble was.

There is some truth in your expert's report that the metal was disturbed when it came in contact with the core, but the result of this disturbance was to retard the flow and cause cold shortage on the internal end where the metal ran sluggishly until the outer body part became filled up above the inlet to this internal part.

MR. REARDON'S CONCLUSION

I have the letter of A. W. Cash, and note that he has had over thirty years' experience in making and gating patterns, and in manufacturing castings therefrom, in iron, steel, brass, aluminum, monel metal, etc.

I respect Mr. Cash's experience, and am somewhat surprised that he would seek information on a question that is so clear in his mind. However regardless of experience, the sample submitted to me for inspection showed without the aid of any glass, canary spots. These indicate shrinkage, in a mixture such as Mr. Cash used for these castings and is often found in test bar fractures. Is always an indication of a poor physical test. I would like to agree with Mr. Cash, but as I see it I can only state the above.

The Aluminum Industry for 1922

Written for The Metal Industry by ALUMINUM MAN

As predicted in our review of the aluminum industry for 1921, business was not normal during the year 1922. While it was better than in the year 1921, and while the larger stocks throughout the country were substantially reduced, the demand was not sufficient to keep the producing and fabricating plants busy. Importations from Europe have been as heavy as last year.

Prices continued low throughout the year although these were increased toward the end of the year.

The increase in the output of automobiles by the different automobile manufacturing companies caused a corresponding increase in the consumption of aluminum castings entering the various parts of cars. While castings have always been an important part of automobile engines, the manufacturers have recently paid a great deal of attention to economy and as a result the aluminum piston has gone into wider use during the year than ever before. Besides the piston, several companies have adopted the forged aluminum connecting rod as standard equipment and it is predicted in many quarters that the aluminum piston and forged connecting rod will eventually become standard with automobile designers. The popularity of the enclosed body has created a demand for automobile sheet for this purpose, and in connection with the use of aluminum sheet for this type of body a great deal of aluminum molding has been consumed. Aluminum molding is now so commonly used for body work that the Society of Automotive Engineers is standardizing the shapes used for this purpose. Besides the forged connecting rod, several of the companies are making many other pieces of aluminum forgings which replace the nickel plated brass used.

The cooking utensil industry has remained good throughout the year, showing the firm basis upon which this industry is established. While the domestic manufacturers have to meet a great deal of foreign competition, it is the general consensus of opinion that the domestic lines are superior in quality and give more satisfaction.

Last year it was mentioned that the Aluminum Company of America has started the manufacture of aluminum collapsible tubes at its plant at Edgewater, N. J. Since then several concerns have adopted aluminum tubes for their use and it is believed that these tubes will prove satisfactory in many lines.

The demand for bronze powder has varied somewhat during the year, being very light the first half but essentially normal during the second half of the year. It is not only used as a paint pigment but is now being used in the rubber business, especially among the rubber tire manufacturers.

The business in aluminum foil is being gradually increased although the market has been somewhat variable throughout the year 1922. The offering of both a wider foil and a thinner foil than heretofore made has given a marked stimulus to the interest in this comparatively new product. It is rumored that a plant for the manufacture of foil is being equipped in the vicitity of New York with American and Swiss capital.

The demand for electrical conductors has been strong throughout the year.

Great interest is being aroused by the success of the high strength aluminum alloys which are marketed under the trade name of 17S and 25S. These seem to be meeting a need that has never heretofore been fully met.

The Aluminum Screw Machine Products Company of Edgewater, N. J., has started operation and is putting on the market the products of automatic screw machines in the form of handles, screws, bolts, etc.

There were no inventions of any importance during the year affecting the aluminum industry.

The outlook for 1923 appears somewhat better than for the year 1922, although it is probable that it will be well toward the end of 1923 before business is materially better than during the year 1922.

The Application of Decoration to Art Metal Ware

A Series of Articles Which Describe in a General Way the Various Processes and Methods Used in the Decorative Application of Ornament to Art Metal Ware—Part 4*

Written for The Metal Industry by A. F. SAUNDERS, Designer, The Benedict Manufacturing Company, East Syracuse, N. Y.

TYPES OF CASTINGS

Roughly speaking the art of metal casting is divided into three distinct methods: sand casting, mold casting and die casting. The first applies in a general way to castings of the harder metals such as silver and bronze when made in sand molds. The second method known to the trade as "slush casting," applies to the use of the softer metals such as white or britannia metal, zinc, antimony and lead, when cast in a mold of bronze or brass without the use of cores. The third method, a purely mechanical operation, is confined to the casting of the softer metals in steel dies, the metal being forced into the dies or molds by the aid of compressed air. All three methods of casting provide means of producing ornamental effects applicable to the decorating of art metal ware.

HISTORY

The art of casting is of great antiquity, dating as far back as the Neolithic Age, and the history of its development in its various phases is a most interesting one.

The earliest known method of casting was accomplished by primitive man pouring molten metal into an open mold, which consisted merely of a cavity of the necessary size and form, hollowed out of a flat stone. The metal he used was either gold or copper, as it is a well established fact that these were the first metals discovered by man. The next step was a crude mold of clay made in two closely fitting sections and baked hard enough to withstand the necessary handling. Fragile as such a mold would be, it was an improvement over the open stone mold inasmuch as it produced a casting both sides of which were alike. By using a core of the same material from which the mold was made a hollow casting was secured. As man became more familiar with the nature of metals generally learning how, by mixing them in various ways, they would better serve the particular purposes he desired to attain, it was but natural that the next step resulted in making the mold of metal. This assured quantity-production as the metal mold did not have to be renewed after each casting as the clay mold did.

The origin of sand casting is difficult to determine. We know that this was the method used by the Egyptians, and many excellent examples in gold, silver and bronze have been dug out of the ruins of the buried cities of ancient Greece. The art of casting in sand was practiced during the middle ages and it reached its highest state of development during the sixteenth and seventeenth centuries. Much of the beautiful gold and silver work of that period depended upon the art of casting for its elaborate embellishment, though the process of casting in itself formed but the groundwork, so to speak, for the finished work. As a sand casting but serves as a means to prepare or facilitate further work, at best such a casting is nothing more than an unfinished reproduction in metal of the original model or pattern. It requires the artistic skill of the chaser to bring it up to that degree of finished perfection necessary to make it a work of decorative value.

Good castings depend first upon a good model, that is a practical model, that facilitates, rather than retards the work of the molder. It should be free from undercuts and modelled in a broad manner leaving the finer details to be worked out in the final chasing.

CIRE PERDUE PROCESS

From the standpoint of art, the so-called lost wax or Cire-Perdue process is the finest form of casting. It differs from sand casting in both method and results. This was the process of casting followed in the time of the celebrated Cellini, and one has but to read the story of his life to realize the difficulties he encountered and surmounted in order to produce some of his masterpieces of cast work done by this exacting method. In Cellini's time the casting required the destruction of the model with one casting only. If for any reason the casting failed, all was lost. This element of chance of course added greatly to the expense of the process, but also added much to the intrinsic value of the finished work, as no duplicates could be made. Another important feature of the Cire-Perdue method is the fact that the casting comes out of the mold complete, requiring but little re-touching by the artist. Modern practice has improved upon the methods used in Cellini's day, as a composition mold of a more permanent character has been perfected which lessens the chances of loss, and cast work of this kind is

STERLING MILITARY TROPHY

produced, in every sense as fine as was ever made in past centuries. The three equestrian figures of Generals Grant, Sherman and Sheridan decorating the base of the Sterling Military Trophy illustrating this paper were

*Parts 1, 2 and 3 were published in our issues of January, 1921; August, 1921, and January, 1922.

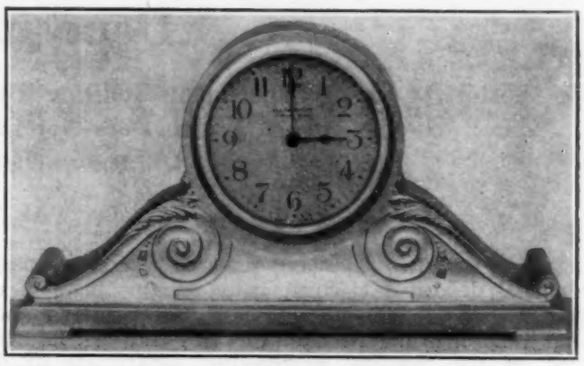
cast by the lost wax method and are fine examples of the art on a small scale.

SLUSH MOLD CASTING

As mentioned at the beginning of this paper slush castings are made in bronze or brass molds and are confined to the use of the softer metals. Slush casting derives its name from the way the metal is handled in the mold during the process of casting. The mold is poured full then quickly reversed emptying out the greater part of the metal but leaving a thin shell or casting in the mold. Next to a good mold, perfect castings depend upon the skill of the caster in handling his metal. As the result desired is a clean, sharp casting of light weight and free from any so-called "cold shots" (air spots), the castings come from the mold practically complete; the mold itself is finished up in fine detail. A good working mold depends upon a perfect model and the skill of the mold maker in fitting, chasing and venting the mold in the proper manner to permit the flow of hot metal into every part. No hand work is necessary to finish up a good slush casting excepting a small amount of trimming and wiping up with a sand buff. Slush castings, however, are basically dependent upon the art of sand casting as the bronze mold in which these castings are made is itself a product of the sand mold, and like all sand castings requires the artistic skill of the chaser to finish them up.

All slush molds are made in two or more pieces, the number depending upon the size and character of the article they are to produce. The mold is first made in plaster of paris; from this is made the bronze mold. Complete objects, both as to form and decoration, are cast by this method, and when plated and colored in various finishes have all the appearances of solid gold, silver or bronze at a very low cost. Candlesticks, lamp bases, clock cases, jewel boxes, desk articles, etc., can all be cast in slush molds. The bronze finished clock case shown in the illustration is a product of the slush mold. It is a hollow casting measuring eleven inches in length by six inches in height, and is some three inchs through from front to back, at its widest point. Considering the general size it is a very light casting at three pounds.

Mold castings have a wide range of use in the decorative field as all sorts of fancy trimmings such as borders, handles, spouts, lips, tips, and ornaments are possible. A large proportion of the decorative ornaments and trimmings used in the making of silver plated wares are mold



CLOCK CASE, CAST IN SLUSH MOLD

castings, made in white or britannia metal, but most of the larger articles such as candlesticks, clock cases, etc., are made of caster's metal a composition of lead and antimony.

DIE CASTING

The process of die casting has been included in this article simply to call attention to its possibilities as a method of producing in a better manner many things of a decorative nature that are now done by mold or sand casting. The greatest drawback to its use in the production of art metal wares has perhaps been due to the great expense of steel dies and the necessary machines for their use. Die castings can be produced cheaply only in large quantities, and the several concerns who make die castings have apparently devoted their main efforts toward the making of castings of a purely mechanical nature especially for the use of the automobile industry. The volume of this class of work has been so great that little time has been given to the development of die cast work suitable for use in the art metal industry. The sharpness of fine detail and the finished state of castings made by this method particularly fits it for the production of metal parts of a decorative and artistic character and advantage should be taken of it. The next article will describe the use of stamping and engine turning.

Review of the Silver Market for 1922*

Production has never been the dominant factor in the silver market, as even a casual comparison of average annual prices and yearly outputs will show. The demand from India and China more than any other factor, accounts for the price levels at which the silver market rules.

A chart of the high and low weekly prices of bar silver in London during 1922 shows a comparatively straight and narrow line—which is another way of saying that the daily fluctuations have not been great, and that approximately the same price levels have been maintained from month to month.

During the past twelve months India has repeatedly proved the chief factor of support and in addition to buying millions of ounces of silver has also evidenced a strong demand for gold, frequently taking all the available weekly supplies coming into the London market.

From data now available it seems certain that the world's output of silver for 1922 will exceed that of the previous year by eighteen or nineteen millions of ounces.

Home consumption in the Arts has shown an increase of more than thirty percent over that of last year. This increase is partly due to the efforts made by domestic silversmiths to expand and increase their business.

	Ounces
Home Consumption in the Arts	24,000,000
United States Mint Purchases under the Pittman Act	62,000,000
Mexican Government Purchases	9,600,000
English Consumption in the Arts	4.500,000
Shipments:	
To India from the U. S.	17,000,000
To India from England	39,000,000
To China from the U. S.	49,000,000
To China from England	21,000,000
Other Buyers	15,900,000

Ever since the disappearance of silver currency and reserves in Europe, optimistic references have repeatedly been made to the boom in store for the silver market when the Governments of the war-exhausted nations again begin to buy for coinage purposes. But with a partial demonetization of silver coins already having taken place in a number of European as well as South American countries, the possibility of government buying for mintage seems remote but the encouraging feature of this phase of the situation is that the supplies of melted coin silver are gradually decreasing.

*Abstracted from "Review of the Silver Market for 1922" issued by Handy & Harman, New York.

Electroplated Zinc and the Diffusion of Electro-Deposits Into Zinc

The Results of These Experiments Indicate That Copper, Brass, Gold and Silver Are Diffused Into Zinc; Whereas Nickel, Which Does Not Diffuse Into Zinc, Can Be Used as a Preventive Against Diffusion of Other Metals Deposited Over It

By WALTER G. TRAUB*

Several instances have been reported where thin plates of metal deposited electrolytically on zinc have disappeared after a few months. This fact seems first to have been brought to the attention of C. F. Burgess, formerly head of the chemical engineering department of the University of Wisconsin. In attempting to gold-plate some articles made of aluminum, he first deposited a coating of zinc, and then covered this with a deposit of gold. After two or three months, the party for whom he did the plating called his attention to the fact that the gold had disappeared entirely.

About a year ago, the Apollo Metal Works of La Salle, Illinois, who electroplate sheet metals on a large scale, reported trouble from the disappearance of brass and copper plate that had been deposited on zinc.

The experiments which follow were undertaken to learn whether coatings of these particular metals are diffused into zinc, or merely fall off, and in case of diffusion, what other electrodeposited metals behave similarly.

To carry out these experiments, a large number of zinc strips were cleaned in the electrolytic cleaner, dried, and weighed. These strips were then plated with different metals and alloys, such as copper, brass, nickel, gold and silver. Preliminary experiments had previously shown that these metals disappeared when plated on zinc in thin layers. The strips were then reweighed to obtain the actual amount of metal or alloy deposited. Because of limited time for observation, they were placed in an electric heater at a temperature of 60° to 80° C. for a period of two weeks.

At the end of that time, the specimens were taken out and examined. They were found to be discolored due to a thin film of oxide, which had formed on the surface. This was removed by immersion in the electrolytic cleaner. Most of the specimens then appeared like ordinary zinc strips. They were polished slightly, but the surface did not change in appearance to any appreciable extent. The deposited metals were only slightly absorbed around the edges of the strips where the deposit was thicker due to the higher current density.

The specimens were then weighed for a third time. It was found that the weight of each strip was practically the same as at the time of the second weighing just after the metal had been deposited. All specimens had been thoroughly washed and dried in all the operations to obviate any unnecessary error. Some specimens had not changed at all in weight, others had lost a few tenths of a milligram, perhaps due to the removal of the dark film spoken of above.

Specimen No. 36 was plated first with copper and then with silver. Both coatings disappeared. Specimen No. 40 was plated first with nickel and then with gold, so that a portion of the gold plate was deposited directly on the zinc. The specimen was then given the same treatment as that described above. Upon final examination it was found that the zinc had absorbed the gold in places where the gold had been deposited directly on the zinc. In places where there was a nickel layer between the gold and the zinc no change took place. Similar results were obtained with the nickel-plated zinc specimens; there was no disappearance of the deposited metal.

TABLE I.
ELECTRODEPOSITS ON ZINC.

No.	Plate	Weight of Zn Strip Grams	Weight of Zn Strip +Deposit Grams	Weight of Zn Strip +Deposit After Heating Grams	Weight of Deposit Grams
1	Cu.....	21.4987			
2	Ni.....	21.0374			
3	Cu.....	21.0982	Deposits unsatisfactory		
4	Cu.....	21.5045			
5	Ni.....	20.2197			
6	Cu.....	20.2365			
7	Brass.....	20.3709	20.4414	20.4414	0.0705
8	Brass.....	19.3744	19.4100	19.4098	0.0356
9	Brass.....	21.3318	21.3781	21.3781	0.0463
10	Brass.....	20.5427	20.5525	20.5524	0.0098
11	Cu.....	20.7171	20.7733	20.7730	0.0562
12	Cu.....	20.7626	20.9370	20.9370	0.1744
13	Ni.....	20.6561	20.7219	20.7219	0.0658
14	Cu.....	19.3450	19.4963	19.4963	0.1513
15	Cu.....	18.7269	18.8067	18.8064	0.0798
16	Ni.....	19.7058	19.9800	19.9800	0.2742
17	Ni.....	20.3665	20.6320	20.6320	0.2655
18	Cu.....	18.8304	18.9809	18.9809	0.1505
19	Cu.....	19.0864	19.0880	19.0877	0.0016
20	Cu.....	18.9690	18.9734	18.9734	0.0044
21	Cu.....	19.0140	19.0290	19.0290	0.0150
22	Cu.....	19.6371	19.6424	19.6423	0.0053
23	Cu.....	19.6100	19.6694	19.6694	0.0594
24	Cu.....	18.3009	18.3111	18.3108	0.0102
25	Brass.....	20.4950	20.5138	20.5136	0.0188
26	Brass.....	20.4380	20.4426	20.4424	0.0046
27	Brass.....	19.3645	19.3667	19.3666	0.0022
28	Brass.....	19.7490	19.7497	19.7496	0.0007
29	Brass.....	20.2290	20.2297	20.2297	0.0007
30	Au.....	9.8780	9.8975	9.8972	0.0195
31	Au.....	10.2237	10.2300	10.2298	0.0063
32	Au.....	10.1100	10.1132	10.1129	0.0032
33	Au.....	9.9000	9.9055	9.9055	0.0055
34	Ag.....	9.5677	Deposits unsatisfactory		
35	Ag.....	10.5875			
36	Cu+Ag.....	10.4766	10.5500	10.5492	0.0734
37	Ag.....	11.1725	Deposits unsatisfactory		
38	Ag.....	9.2498			
39	Ag.....	8.8972			
40	Ni+Au.....	9.5600	Good results.		
41	Ag.....	10.5600	10.5865	10.5865	0.0265
42	Ag.....	10.0919	10.1199	10.1199	0.0280
43	Ag.....	9.3700	9.4093	9.4093	0.0393

Specimens 34, 35, 37, 38, 39—very small amount of copper plus silver plate.

When plating zinc with silver, it was found necessary to use the standard silver "striking solution." This was done by first cleaning the specimen, then making it the cathode in a cell containing the "striking solution." The anode was silver. The specimen was plunged into the

*Senior in Chemical Engineering, University of Wisconsin. A paper presented at the Forty-second General Meeting of the American Electrochemical Society held in Montreal, September 21, 22 and 23, 1922.

electrolyte for just a brief instant. It was then washed and placed in the usual cyanide bath for silver deposition. A beautiful deposit of silver was obtained which was permanent and did not come off by rubbing or by wear, but was absorbed on heating.

The nickel plates were deposited from a solution designed especially for the direct nickeling of zinc. The solution contained sodium citrate. The gold, silver, brass, and copper were, of course, deposited from cyanide solutions.

These experiments show conclusively that thin plates of copper, brass, gold, and silver are diffused into zinc. Nickel is not diffused into zinc, and it can act as a preventive against diffusion of other metals deposited over it.

TABLE II.

APPEARANCE OF SPECIMENS.

No.	Plate	Dimensions Cm.	Before Cleaning (Oxide)	After Cleaning
8	Brass...	10.3 x 4	dark gray	gray
10	Brass...	10.9 x 4	dark gray	gray
11	Cu.....	11.1 x 4	grayish brown, edges brown	grayish brown, mottled
12	Cu.....	10.3 x 4	same as No. 11	gray, brown edges
13	Ni.....	9.7 x 4	not affected	not affected
14	Cu.....	9.9 x 4	gray, reddish brown edges	gray and brown, mottled
15	Cu.....	10.1 x 4	same as No. 14	same as No. 14
16	Ni.....	9.8 x 4	not affected	not affected
17	Ni.....	9.7 x 4	not affected	not affected
18	Cu.....	10.4 x 4	brownish	gray and brown
19	Cu.....	10.3 x 4	gray, brown edges	gray
20	Cu.....	10.3 x 4	same as No. 19	gray
21	Cu.....	10.3 x 4	gray, purple edges	gray
22	Cu.....	10.2 x 4	same as No. 21	gray
23	Cu.....	10.5 x 4	brown and purple	gray, brown edges
24	Cu.....	10.4 x 4	gray, purple edges	same as No. 23
25	Brass...	11.9 x 4	brown, reddish	gray
26	Brass...	11.6 x 4	same as No. 25	gray
27	Brass...	11.7 x 4	gray, brown edges	gray
28	Brass...	11.6 x 4	yellowish gray	gray
29	Brass...	11.8 x 4	yellowish gray	gray
30	Au.....	11.5 x 4	gray	gray
31	Au.....	5.2 x 2	very dark gray	gray, silvery
32	Au.....	5.9 x 2	grayish black	gray
33	Au.....	5.9 x 2	grayish black	gray
36	Cu+Ag.	11.6 x 2	gray	gray
41	Ag.....	11.3 x 2	gray	gray
42	Ag.....	12.0 x 2	gray	gray
43	Ag.....	10.8 x 2	gray	gray
40	Ni+Au.	.....	.....	gray where Au directly on Zn; with layer of Ni between, no change

Silver Plating Cutters

An Answer to a Plea for Greater Accuracy in Handing Out Plating Information

In the November issue of the Monthly Review the editor comes out with the following statement (we purposely omit personalities):

We will take as an example the question asked by a plater who evidently is having trouble plating **knives,** and the answer as given in a recent issue of a trade paper. In the answer the following formula for solution was given:

Water ..	1	gallon
Sodium Cyanide	3	ounces
Silver Cyanide, 80%	2½	ounces
Carbonate of Potash	1	ounce
Brightener	1	to 2 drops

and with this solution recommended the use of 12 amperes per half-dozen **knives,** or 24 amperes per dozen, or plating a vat of **knives** with 14 dwts. of silver per dozen in 13.5 minutes. It was also suggested that a bright or skim-milk color is best plate for **knives.**

It occurred to us when reading this that if the plater carried out these instructions he would be plunged deeper into trouble than before, because the answer is **impossible.** In our opinion knives cannot be plated in above solution with 14 dwts. of silver in less than that many minutes, or at the rate of 24 amp. per dozen knives with ordinary temperature and agitation. But not trusting our limited knowledge we sent the following questions to 12 different platers who are now plating knives, or who have all had experience in knife plating (all members of the A. E. S.):

(1) Do you believe that knives can be plated in the above solution at the rate of 24 amperes per dozen, with ordinary temperature and agitation?

All answered, No.

(2) If not, what amperes per dozen would you recommend?

One and one-half to 10 amperes—average 5 amperes per dozen.

The jury of 12 platers to whom the matter under discussion was submitted, stated that knives **cannot** be plated with a current of 24 amperes per dozen, in the solution suggested that 5 amperes per dozen is more nearly correct. Or, instead of plating 14 dwt. knives in about 14 minutes, it requires about an hour, which is some difference in a day's output.

The problem was taken from THE METAL INDUSTRY, for September, 1922. It was answered by Charles H. Proctor, the Plating-Chemical Editor. Hence this reply.

Now, what are the facts? Question 3 of this inquiry read as follows:

How long should this **tinned ware** be in solution before it assumes that heavy white clamshell color?

This shows that the problem in question was not the silver-plating of knives in the ordinary sense, but the **silver-plating of knives that had been previously tinned.** This necessarily changes the whole aspect of the problem, since it becomes one of plating silver on tin (or in this case, on a mixture of 90 parts tin and 10 silver applied by the molten dip method on the knives). This was completely overlooked by the writer of the criticism and the letter to the twelve platers.

Furthermore, the solution given was not recommended for silver-plating in general. It was given in response to a request for a solution containing 2 ounces of silver per gallon, and for a very special purpose, namely that of plating silver on the 90-10 mixture given above. As a matter of fact, (as stated in a later letter) it was nothing more than a silver strike solution.

As regards the efficacy of the advice given by Mr. Proctor to the inquirer, we quote from a letter received shortly afterward:

Yours of the 13th inst. at hand, and must say that your plating expert, Mr. Proctor, must have evoluted from a plating tank. I know of no other way to so fully express the appreciation of his almost uncanny correctness in answering the million and one questions that aid in the evasive and slippery art of electro deposition of metals upon metals.

We believe that no more need be said.

Our Immigration Laws and the Labor Shortage

Engineers Discuss This Question, Which Is of Importance to Manufacturers

By WALTER RENTON INGALLS[1] and DANIEL BLOOMFIELD[2]

At a meeting of the New York section of the American Institute of Mining and Metallurgical Engineers on January 3, 1922, the topic for discussion was on immigration laws and the labor shortage. The following are abstracts of the speeches made by the two speakers of the evening:

WALTER RENTON INGALLS

There is no doubt a shortage of labor of some kinds and at some places. The best evidence of this is the fact that employers have raised wages in order to get what they want, which they would not do unless they had to. However, in the broadest view the labor shortage and effects of immigration curtailment are being misunderstood and over-rated. Although business activity in the United States in 1922 rose materially from the abyss of 1921 the year's production was no larger than in 1913, although during the interval the population of the country, and correspondingly the number of workers has increased by about 12.5 per cent. Undoubtedly we have enough labor supply among us, but it does not want to do some of the things that are needful, and temporarily at least, is able to behave according to its wishes. There are strong economic arguments to the effect that such a condition can not continue indefinitely.

This is not to be construed as upholding the present immigration law, which is framed with terms that are quite stupid. It must be recognized moreover that although the labor unions are in favor of immigration curtailment the inspiration of the present law is the idea among many of our people that we have been putting too much infusible material into our melting pot. Liberality in immigration policy is desirable for the reason that artificial economic barriers are generally unwise. A sane policy would be, in the first place, to make the acquisition of American citizenship far more difficult than it is now. Register the 8,000,000 aliens that we now have with us. Institute selective immigration, controlling the movement from the ports of origin. Keep track of the immigrants after they arrive here and steer them to the places where they are needed, preventing them from congesting in the big cities.

DANIEL BLOOMFIELD

On June 3, 1921, Congress passed the Dillingham percentum law. This law provided that the number of persons of any nationality who may be admitted to the United States in any fiscal year shall not exceed 3 per cent of the number of persons of like nationality who were in the United States in 1910 as shown by the Census of that year. Nationality in this case is determined by country of birth.

What we want to know is how real a shortage of labor there is, the kind of labor that is needed, and the possibilities of securing such labor in the future. If it is merely cheaper labor that is desired that is one thing; but if, as seems to be the case, more adequate labor is wanted then we must find out what is the relation of our present immigration laws to such needs in a very specific way.

Do we really know how much of a shortage of labor there really is or is likely to be? The weekly service for executives, called Industrial Relations, of which I am Associate Editor is now making a nation wide survey of the facts in the situation soon to be made public. From the reports thus far received we find conflicting testimony. Reports of need for unskilled labor come from the steel industry and building construction. Many find it difficult to get labor for wet, dirty jobs. They say American labor won't work at such jobs. Others find it hard to get labor because of inadequate housing conditions and high rents. In other cases the constant shifting of workers makes the demand for labor rise.

Connecticut reports a shortage of about 3,500 men mostly unskilled. Maine, Texas, Georgia, Florida, Kentucky, Alabama report no shortage. New York reports some shortage especially in skilled trades, Massachusetts no serious shortage. In Boston there is a slight shortage of men in building trades, in Worcester, a slight shortage of metal workers, in Springfield no shortage. Lynn no shortage.

In Pittsburgh shortage is reported especially among foundry workers. Philadelphia some shortage of common and building trades mechanics. Other cities in Pennsylvania report no acute condition.

North Carolina and South Carolina is short of farm labor which is seeking more profitable employment elsewhere. In Illinois the situation is spotty. In Arizona there is a scarcity of American common labor though Mexican labor seems plentiful. Oklahoma and Montana report no serious shortage. In Michigan shortage is reported in Detroit and in the mining section.

These are incomplete returns but they serve to indicate the trend of things. The difficulty lies in getting figures of the actual shortage, duration of the shortage of various kinds of labor in plants, the nationalities affected and so on. Only intensive surveys by the industries themselves will secure accurate data.

There are three things that the individual plant or an industry can do right now to help. They are:

1.—To secure accurate data of the rate of labor turnover in the plant classified according to causes, nationalities, trades, length of service and so on.

2.—To take necessary steps in reducing the turnover by the organization of employment departments and employes service work to build up a contented working force. This means job adjustment, training, etc.

3.—To study the problem of local intermittent, seasonal industries with a view to making employment more regular therein.

4.—To present the figures of labor shortage (and a good record with regard to 1, 2, 3) to Congress if such figures indicate the need for revision of our immigration laws.

The next step in meeting the problem if labor shortage is likely to become acute, might be a Federal Commission made up of a representative of the Department of Labor, Department of Commerce, representatives of employers, employees, and the public groups to make a thorough study of the facts in the situation. If the facts then warrant action. Congress might modify the contract labor clause in the immigration law so as to permit this Commission to bring in the type of laborers where work for them is guaranteed and for the period guaranteed by the concerns that need such labor. Such a Commission working with the immigration department would act as a clearing house for labor and could so allocate labor that it would meet our needs. The percentum law might remain but this Commission could be given certain leeway in opening up or shutting down on the labor supply from abroad.

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[2] Consultant in Industrial Relations, Boston, Mass.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER, THE ELECTRO-PLATERS' REVIEW

Published Monthly—Member of Audit Bureau of Circulation

Copyright 1923 by THE METAL INDUSTRY PUBLISHING COMPANY (Incorporated)

Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, United States and Canada $1.00 Per Year. Other Countries $2.00 Per Year :: SINGLE COPIES, 10 CENTS
Please Remit by Check or Money Order; Cash Should Be Registered

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THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK
Telephone Number Beekman 0404. Cable Address, Metalustry

Vol. 21 New York, January, 1923 No. 1

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EDITORIAL

Retrospective Review of 1922—Outlook for 1923

The past year, industrially, has, as a whole, lived up to expectations, in fact, almost up to hopes. It started out at a low ebb and for this reason, if none other, it was expected to improve. It did improve considerably although somewhat spottily.

It cannot be said, of course, that business was good simply because it was better than in 1921, since in that year it was almost negligible. Nevertheless, the advance was, on the whole, so great as to be decidedly encouraging. Prices seem to have become stabilized, although not at points statistically ideal. Manufacturing has adjusted itself to the buying public's demand and is no longer producing two articles for every one sold. Although that large and most important part of our national life, agriculture, is still in difficulties, due to the fact that prices commanded by farm products are still proportionally far below those commanded by manufactured products, it seems to be gradually working its way out.

It must not be thought, however, that all our industrial difficulties are being smoothed out. We have at least two great problems on our hands, which during the past year, forced themselves upon our attention in no uncertain manner. They are the problems of operating the railroads profitably without charging more than the traffic can bear and producing coal economically. These, added to the ever-present difficulties with labor, make a total which should successfully prevent any undue or excessive optimism.

METALS IN 1922

The year has shown a consistent improvement in almost every case. Copper was weak during the first period but ended strong. Tin, with its usual daily fluctuations has had a fairly consistent rise since March, its lowest period. October, November and December have brought it to its highest. Lead and zinc have had almost spectacular years, rising steadily from the beginning to the end. Their future seems to be excellent. Silver, after a little boom in April, May and June has gradually slipped back. Domestic silver is still held at $1.00 an ounce under the Pittman act. Nickel, in spite of the staggering cut in its market, made by the suspension of armor plate manufacturing, held its price fairly steadily, suffering but one decline of 5 cents during the year on the part of the leading producer, and approximately holding its own in the open market. Aluminum which began the year very low rose sharply on the enactment of the Fordney-McCumber tariff. It bids fair to hold its rise.

A detailed statement of the metal situation can be found on page 45 of this issue.

TECHNICAL ADVANCEMENT

In spite of the fact that it was not a brilliant year, a number of things of real interest appeared in the industry. Among the alloys which attracted considerable public notice during the year were Elektron metal, an alloy composed principally of magnesium, Frary metal, of lead and barium, and Alpax, an aluminum-silicon alloy.

A new induction furnace for melting brass was placed on the market. Crucibles made of a carborundum mixture seem to have made distinct advances.

The art of centrifugal casting, upon which much experimental work has been done during the past few years, began to achieve wider popularity and promises to spread much further.

In the plating field among the developments of interest were the contractometer, invented by E. A. Vuillemier, the Belke tank filter and the Udylite process.

How far any of these new developments will go is, of course, impossible to say now. It takes a long period for an industry to decide whether or not it will accept a new departure.

Due to business conditions, the progress of the electric furnace industry was not so great as it has been in previous years. Nevertheless, a number of furnaces were sold and all things considered, the year was very satisfactory.

Work of unusual scientific interest is being done to determine the constitution of metals and alloys. Bassett and Davis of the American Brass Company wrote on Spectrum Analysis, by means of which very small quantities of material could be discovered. In this way, impurities in raw material could be discovered with comparative ease. Work on the Slip Interference Theory of hardening metals was done by Jeffries and Archer, and an investigation into the Crystal Structure of Solid Solutions was made by Bain.

Work of inestimable value was done by the Bureau of Standards, the American Engineering Standards Committee and the American Society for Testing Materials co-operatively. In addition to the regular scientific work of the Bureau a division on simplified practice was established, its purpose being simplification of specifications for various engineering materials. It would hardly be an over-statement to say that savings already accomplished run into millions per year. The American Engineering Standards Committee approved a number of standards recommended by the American Society for Testing Materials which will result in the elimination of misunderstandings, mistakes and duplications. The research on molding sands carried on by the National Research Council, the American Foundrymen's Association and the Institute of Metals Division is going on. A most comprehensive review of electric furnaces in the brass industry has been published by the Bureau of Mines entitled "Electric Brass Furnace Practice" by Gillett and Mack.

Another airship disaster, that of the Roma, a dirigible built, like most others, with duralumin framework,

brought into serious question the expediency of using hydrogen as a lifting medium. Since then plans have been laid and carried forward to manufacture helium in sufficient quantities to replace hydrogen, thus diminishing greatly the risk of explosion. It was thought also that some of the troubles were due to the inherent effects of duralumin as a structural material but a report of the Aeronautical Research Committee of the British Air Ministry brought out the fact that the disaster of the Z-R 2 had been due, largely, to faulty design, and that there was no thought of discarding Duralumin as a structural material.

ECONOMIC DEVELOPMENTS

Among the more important economic factors in the nonferrous industries was the Copper and Brass Research Association which carried on a vigorous campaign to increase the use of copper and brass. This association concentrated its efforts on the building and hardware trades, and according to all reports, succeeded in increasing the consumption of copper by a considerable extent. The Anaconda-American Brass merger had no more effect upon the brass business than the resignation of six officials of the American Brass Company. Rumors, of course, were numerous. It has been stated with an air of certainty that the Scovill Manufacturing Company and the Chase Companies have both refused consolidation offers from the Calumet and Hecla Mining Company. Actual changes, however, have gone no further than the absorption of the Brown Copper and Brass Rolling Mills in New Toronto, Canada, by the American Brass Company.

The tariff was finally passed in a form modified from the original Fordney bill and although its effects were immediately noticeable in the price of aluminum, it is too early to say what its general effects will be.

Great public interest has been manifested in regulating trade associations and preventing them from illegally holding up prices. An excellent movement for co-operative action along these lines was instituted by Secretary Hoover who grasped the fundamental necessity for trade organizations. This movement bids fair to permit business to continue to co-operate legally, and to secure information which is absolutely necessary to its well-being, without breaking the law.

The restriction of immigration has, it is claimed, begun to be felt in the industries, resulting in shortage of labor, and in some conspicuous instances, rises in wages. The unemployment which was so wide-spread during the early part of the year, totalling, it was estimated, as much as 5,000,000, was reduced to normal proportions, and in many localities real shortage of labor was felt. As a result there has been considerable agitation for the revision of immigration laws.

INDUSTRIAL RELATIONS

The country was afflicted with two great strikes during 1922, one on the railroads and the other in the coal industry. Between them they succeeded in crippling what might have been a fairly general revival in the metal trades during latter part of the year.

The coal strike resulted in a constructive step by the Government in the appointment of a National Coal Commission to investigate the coal industry and to report to Congress.

NECROLOGY.

Among the men of prominence in the metal industries who died during the past year were: Henry Vits, founder of the Aluminum Goods Manufacturing Company, Manitowoc, Wis.; A. S. Brown, vice-president of the Ansonia Branch of the American Brass Company; George W. Peck of Miner & Peck Manufacturing Company, Derby, Conn.; Guy L. Meaker, president of the Meaker Galvanizing Company, Chicago, Ill.; James A. Doughty, president of the Torrington Manufacturing Company, Torrington, Conn.; Chas. F. Molley, president American Boron Products Company, Reading, Pa.; William N. Best, president of the W. N. Best Furnace & Burner Corporation, New York; Benjamin H. Bristol, president of the Bristol Company, Bristol, Conn.; Dr. Henry M. Howe, professor emeritus of metallurgy at Columbia University, New York; John H. Patterson, president of the National Cash Register Company, Dayton, Ohio; M. H. Van Bergh, vice-president Van Bergh Silver Plating Company, Rochester, N. Y.; Wm. Gleason, president Gleason Machine Tool Company, Rochester, N. Y.; Thomas Devlin, president Thomas Devlin Manufacturing Company, Philadelphia, Pa.; Howard C. Noble, president North & Judd Manufacturing Company, New Britain, Conn.; John W. Rapp, president Art Metal Company, Long Island City, New York; Chas. Glover, former president Corbin Screw Corporation, New Britain, Conn.; Chanler N. Wayland, former president of Holmes, Booth & Hayden, Waterbury, Conn.; Frank S. Washburn, chairman of the Board of Directors, American Cyanamid Company, New York; Edward Darling, vice-president Aluminum Company of America, Pittsburgh, Pa.; F. G. Niedringhaus, president National Enameling & Stamping Company, St. Louis, Mo.

OUTLOOK FOR 1923

The consensus of opinion seems to be that the coming year should be good. The prospect for metals is, of course, impossible to predict in detail but so far as the statistics in hand show, their position is excellent. The building projected for the coming year has been estimated by the Copper and Brass Research Association at about $6,000,000,000 which according to their figures offers a possible market for 780,000,000 lbs. of copper in the form of copper and brass. The automobile industry, which has been going on at a high rate of speed for the past six months, has as yet shown no sign of slackening. It is to be hoped, however, that nobody will sit back in expectation of a continued increase. While this is possible theoretically, the past history of the automobile industry makes it doubtful. The electrical industries, aside from fads like the radio business, is still operating at a good rate, and even the radio industry, when it has outlived its first flush of youth, will settle down and assume a legitimate place of fair importance. The railroads are decidedly better off than they were last year and their buying has been of utmost importance. There is no reason why they should not continue.

The year has been a hard uphill pull but the word "uphill" implies moving to higher ground. This is undoubtedly the case. If the future depended upon this country alone, prophecy would be far easier but our industrial situation is so entangled with that of Europe that any predictions which include a situation over which we have no control would be futile. Nevertheless, we are so very much better off than we were a year ago that a certain amount of optimism is justifiable.

Twenty Years of Service

Twenty years ago, in January, 1903, THE METAL INDUSTRY was founded by Palmer H. Langdon and the late Erwin S. Sperry, that there might be a technical and business publication devoted to the fabrication of all of the metals and alloys except the iron. These metals and alloys include brass, copper, tin, lead, zinc, aluminum, nickel, silver, gold, bronze. Our purpose was to describe accurately the various methods of manufacture required in the production and fabrication of these metals and the metallurgical, mechanical and chemical arts, included the processes of smelting, refining, fluxing, fusing, alloying, casting, founding, molding, machining, grinding, extruding, rolling, drawing, stamping, spinning, annealing, smithing, brazing, tinning, zincing cleaning, dipping, etching, plating, polishing, coloring, finishing, burnishing, enameling, japanning and lacquering.

THE METAL INDUSTRY was the successor of the Aluminum World established in October, 1894, a journal originally relating to the aluminum business alone, and afterwards embracing the brass and bronze industries.

There have also been incorporated in THE METAL INDUSTRY two other publications entitled "Copper and Brass" and the "Brass Founder and Finisher and Electro-Platers' Review."

During the life of THE METAL INDUSTRY we have issued 240 numbers and published the following:

2,780 Main articles, relating to every branch of metal work and written by the ablest writers that could be found on metallurgical, mechanical and plating-chemical subjects.

689 Editorials on industrial topics of the times.

559 Letters on miscellaneous subjects written by the readers of THE METAL INDUSTRY who had something of interest to say on timely topics.

3,153 Shop problems, written by practical men, and everyone of which containing a practical answer, that can be worked out sucessfully in the shops.

2,584 Patents recording inventions which related to the metal industry and its kindred devices.

1,540 Equipments describing the latest and best shop equipment.

216 Pages of Personal Items and 555 Obituaries.

1,515 Pages of Business News.

254 Pages on the Metal Market, written by market experts.

536 Pages of Prices on Metals and Supplies.

12,542 Pages of advertisements containing announcements and information of value to metal and plating shops.

THE METAL INDUSTRY, therefore, in its twenty years of service has been in itself an active research association insofar as is concerned every phase of metal fabrication—recording the best practice and the most advanced progress in every branch of the production, manufacture and distribution of metals.

From a small trade journal of 28 pages and 2,000 output in 1903, THE METAL INDUSTRY had grown to a 200-page publication and over 6,000 distribution in January, 1920.

Our circulation figures are audited by the Audit Bureau of Circulations, of which we are a member.

Owing to the business depression of the past two years, our circulation and advertising has suffered in common with all business publications, but with the prevailing business revival, we believe we can readily surpass all former records, again making THE METAL INDUSTRY larger, better and more interesting than ever.

During our lifetime we have had the pleasure of discovering and presenting many authors and writers who before the advent of THE METAL INDUSTRY were unknown in the field of metal literature. In fact, when our journal was established there was a dearth of printed information on metal and plating shop practice and a lack of writers. But these unknown but competent authors came forward, one by one until now we are pleased to have a host of contributors who represent the best thought and practice of the industry. A review of our bound volumes indicates the number of these industrial celebrities.

Besides these contributors we have as a board of associate editors, representing their respective callings. They are Jesse L. Jones, Metallurgical, William J. Reardon, Foundry, Peter W. Blair, Mechanical, Louis J. Krom, Rolling Mill, Charles H. Proctor, Plating-Chemical, R. E. Search, Exchange-Research.

These experts with the regular staff, consisting of Palmer H. Langdon, Editor and Publisher, Adolph Bregman, Managing Editor, George W. Cooper, Advertising Manager and Thomas A. Trumbour, Business Manager, the majority of which have been connected with THE METAL INDUSTRY from the earliest issues assure our readers and advertisers that they can look forward to continued progress on the part of this publication.

We thank our subscribers and advertisers for their continued patronage in the past and are firm in the faith that this co-operation will continue in the future.

TECHNICAL PUBLICATIONS

Electric Brass Furnace Practice.—Bulletin 202 of the Bureau of Mines, Washington, D. C., by W. H. Gillett, Chief Alloy Chemist, and E. L. Mack, Assistant Alloy Chemist. Copies of this bulletin can be obtained from the Superintendent of Documents, Washington, D. C., for 50 cents.

As the result of a study of brass-furnace practice in the United States, the Bureau of Mines delcares that the complete substitution of electric furnaces for the crucible and oil-fired types should result in savings in the brass-melting industry amounting to two or three million dollars a year. The bureau estimates that, if all brass made in the country could have been melted electrically in 1917 and 1918, the war expenses of the country would have been reduced some twenty million dollars.

The manufacture of brass in the old style types of furnace has been characterized by enormous losses of zinc through vaporization, possibly as much as 6 per cent of the metal present having been lost in making brass castings and 10 per cent in making wrought brass. It has been estimated that 7,500 pounds of zinc passed into the atmosphere daily in the form of zinc oxides from the stacks of the brass-casting shops of Waterbury, Conn., alone.

Safety Code for the Protection of Industrial Workers in Foundries.—Tentative American Standard approved by the American Engineering Standards Committee. This code is the result of the work of the committee made up of representatives of employers' associations, governmental bodies, insurance organizations, technical associations and a labor union. The code deals with foundry conditions only, leaving out such subjects as building construction, exits, stairways, elevators, lighting, sanitation, etc., as these subjects are covered by other codes. It covers plant layout, machines and equipment, lighting, heating and ventilation, operating rules, safety and welfare.

CORRESPONDENCE and DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein

Electro-Plating, Its Past, Present and Future

To the Editor of THE METAL INDUSTRY:

I would like to have a say in connection with Mr. J. Haas' "Indictment of the Typical Foreman Plater and his Attitude Towards the Scientist" that appeared in the October number of your paper. At the end of Mr. Haas' statement, there is a quotation from THE METAL INDUSTRY of June, 1921. "Eventually this business may get into the hands of the chemists," runs the quotation. Sir! I shuddered when I read that; and I prayed that heaven would not inflict such punishment upon the Art of Electro-plating! At the other end of his indictment, Mr. Haas lists a lot of names, and then asks: "Where are the practical electro-platers?" I rather fancy that Roseleur, Alexander Watt, the brothers Elmore, and the Elkingtons—to mention only those that come at once into the mind—would not object to being called "practical platers"; while, on the other hand, I imagine Arrhenius would smile at the assertion that his "practical works" had "brought about rapid progress in electro-plating."

One finds it rather difficult, even after ploughing through four columns of indictment, to understand what the **real** burden of Mr. Haas' complaint is. Is it that the members of the class he started—as an experiment, he tells us—last summer did not sufficiently appreciate the excellence of their opportunity? One is tempted to ask: Was that their fault, as well as their loss; or was it any fault of Mr. Haas'? Who does not know that some of the most learned of men have been unable to impart their learning to lesser souls? Since I cannot gather much from the four columns. I betake myself to the headings of Mr. Haas' article, and, among them, I find the words: "His attitude towards the Scientist." The whole article is an indictment: I, therefore, assume that Mr. Haas complains that the foreman plater's attitude to the scientist is not one of much respect. Well, why should it be? What has the scientist done for the plater? The scientist addresses himself to his own kind; and his discoveries are wrapped up in a jargon that only those of his kind can understand. Sometimes, even they do not understand it! I seriously doubt whether the average scientist so well understands applied electro-chemistry, and especially electro-plating, as to be able to translate his discoveries into our common tongue. I find the most appalling exhibitions of ignorance performed in the text-books (so-called) written by the scientists. Instances are unnecessary. And my experience of scientists in plating shops is that they are, most of them, impossible nuisances: I certainly would not have one in any shop that I was connected with, unless he had had 12 months' work alongside the vat—at someone else's expense. In my opinion, it is just as true to say that the so-called scientist knows as little about electro-plating as the plater does about science: as for knowledge of human nature, I would back the plater. And there's the rub! If the scientist would care a little more about understanding human nature, and a little less about airing his atoms and his molecules—his H's and his O's—the gap between him and the plater would become narrower and, maybe, disappear. The attitude of the scientist in the plating shop is such as to infer that he and he alone is the fount of knowledge. It is a mistaken attitude, founded upon error. The plater knows this, and resents the attitude. If the scientist would realize that he has more to learn than he has, from his stock of knowledge, to teach, that gap I have mentioned would, from this cause too, soon begin to close up. The plater is not unwilling to learn; but he is not going to listen to those in whom he has no confidence and when he believes (and, usually, rightly believes) to be possessed of but little, if any, understanding of the plater's art. If, then, the scientist exhibits his woeful ignorance to the plater in his text-books, and his indifference to the plater's needs in his technical papers, as well as by his supercilious and condescending attitude in the shop, why should the plater respect him? I, for my part, do not know: Mr. Haas does—perhaps.

Maybe, though, I am wrong, and Mr. Haas does not mean that the plater has no respect for the scientist, but means, rather, that the plater pays insufficient regard to the scientific foundations upon which his art rests. In that case, and if that be so, I ask: Is that the plater's fault?

First, is it to be expected that a man who has spent 8 to 10 hours a day in a plating shop will readily consent to occupy such little leisure time as he has in studious pursuits at some technical school, especially when the teachers, as often as not, know little and care less what the practical man needs and how to supply him with it? I ask Mr. Haas to put on his thinking cap, and to seriously ask himself whether he would do so. If he answers, Yes, then I ask him further—Does he believe that study carried out by a tired man is really profitable? Personally, I have never found it so.

Next, if the plater cannot be reasonably expected to attend classes after his day's labor in—often—a by no means wholesome atmosphere, when can he devote any time and attention to the theoretical side of his subject? The answer is: **He can do so in the shop, if he is given the opportunity.** But the giving of such opportunity rests with the employer—not the plater. If the employer encouraged the plater to experiment with a two-gallon vat, it is my opinion that both employer and plater would benefit. The plater would become keen to find things out for himself; he would be led on by his keenness from good to better, and would, in no long time be found consulting technical articles and papers, and he would take a lively interest in technical meetings and discussions. The employer, in his turn, would benefit from the results. The facilities he afforded his man would assuredly not be wasted. Yet, how many employers would give them? It is not necessary that a plater should become an analytical chemist. How many trained chemists could tell one what substances are present in a silver vat two months after that vat has been at work? And as for brass, there is no chemist living that could make an exact, or even an approximately exact, quantitative analysis of a brass-plating solution half an hour after a current had been through it. All that a plater needs of chemistry is (1) a thorough acquaintance with the laws of Faraday, so that he can evaluate the efficiencies of his baths, and (2) some little knowledge as to how to make a few quantitative determinations—most of them volumetric. These things he can learn and do for himself in the shop.

And thirdly, I have said something as to why the plater has no exaggerated regard for the genius of the scientist. If this gentleman would learn how to really help the plater in speech and act, instead of assuming that he himself has nothing to learn, and that his book knowledge is everything and workshop experience, over five, ten, or more years, nothing, then he would soon find that the plater would respond and, as I know from experience, would even come to him in and with his difficulties.

Sir, I am not writing a word for the plater because I think all platers are perfect beings. They are not, any more than are all scientists. I am taking up the cudgels for the plater, because I know him and his life, and because I know he has but little chance for improvement. I am doing so, too, because I have many a time stood side by side with the plater, facing, and with his invaluable help, meeting, difficulties in the shop; and as the result of my long experience I can truly say there is no more honest and willing worker in any trade.

W. E. HUGHES.

London, England, October 24, 1922.

To the Editor of THE METAL INDUSTRY:

Mr. Hughes being an Englishman, and acquainted primarily with conditions as they exist in England, is incapable of passing judgment upon conditions as they exist in the electro-plating industry in the United States.

I shall reply to Mr. Hughes' letter by paragraphs.

1. Roseleur, Alexander Watt, etc., without a question of doubt would be pleased to be called practical electro-platers, but they were besides something more, they were scientific invstigators; they were not "cook-book" platers which is what the practical plater of to-day is; they looked more into the why and how of their work according to the conceptions of the day. Mr. Hughes has, evidently not learned the difference between practical and scientific works. He believes that there is a wide difference. He has not seen where they come together. Has Mr. Hughes derived no benefit from the dissociation theory of Arrhenius with subsequent discoveries by more detailed study of this theory?

2. Mr. Hughes evidently has not read my article correctly, otherwise, he would not state that he does not know what complaint is being made. The complaint is that **the electro-plating industry is held in scant respect by manufacturers and their managers, and that the fault lies with the foreman plater, the platers helpers and the manufacturer** (another point Mr. Hughes has missed). The question of the success of the class, my ability as a teacher, is irrevelant. I leave that to those whom I have taught, in the class-room and shop.

In this country we have many men, already mentioned, who try to the best of their ability to place their works pertaining to electro-plating in comprehensible language. The plater ought to meet them half-way and make up by his technical understanding what the chemist cannot put entirely in so-called practical language. Most of Mr. Hughes' allegations regarding scientists are not true of those in this country.

3. Exactly what I mean and I stated so in the article. If the electto-plating industry is applied electro-chemistry, then those that practice it would do much better work if they understood the technical principles upon which their work was based. It is not expecting too much that a person should spend two nights of two hours each for 3 or 4 years in the effort to make his later years much easier. Yes, I would do it and have done it. Moreover, it must not be expected the chemistry of electro-plating can be fed with a silver spoon. Night classes, like day classes are scheduled to do the most general good. Each must pick out his own food, chew and digest it. And such work can be carried on profitably. It has been done by thousands of people.

4. Answer to Mr. Hughes' fourth paragraph is in the article. He should read it over again.

5 and 6. Mr. Hughes has therefore, taken the side of the plater against the scientist because he is not acquainted with conditions as they exist in this country. The plater has a chance for improvement in this country, can get all the help he needs in the way of advice from others, but he refuses to have it, because he thinks he knows it all. He is, as has been stated by "Assistant Foreman," in these columns of the December issue of THE METAL INDUSTRY, "full of bunk."

Muncie, Ind., December 15, 1922. JOSEPH HAAS, JR.

New Books

A List of Alloys, by William Campbell, Professor of Metallurgy, School of Mines, Columbia University, N. Y. Published by the American Society for Testing Materials. Size 6¼" x 9½", 30 pages. Price payable in advance $1.00. For sale by THE METAL INDUSTRY.

This is the nearest to a complete list of non-ferrous alloys that has been published recently enough to be considered up-to-date. Dr. Campbell in his introduction states, "it is realized that this list is incomplete and additions or corrections will be very welcome." However, it is very doubtful if any better list could have been compiled in view of the existing situation in the non-ferrous industry.

Alloys are divided for the sake of easy reference into the following groups:

Brasses.
Bronzes.
Copper Nickel Alloys.
Nickel Silver (Agiroide, Alfenide, Argentan, Arguzoid, Argyrolith, Electrum, Neusilber, Nickelin, Maillechort, Packfong, Sterlin, Tutenag, White Copper, etc.)
Aluminum Bronzes, etc.
Copper Manganese Alloys.
Aluminum Alloys.
Tin Base Alloys.
Lead Base Alloys.
Zinc Base Alloys.
Fusible Metals.
Gold Alloys; Silver Alloys;
Platinum, etc.
Resistance Alloys; Heat Resisting; Non-Corrosive Alloys.

Where nothing is known except the name, it will be necessary, of course, to look through each of these groups but the work entailed is so small since the alloys are listed alphatbetically that it takes but a few minutes to find any mixture desired. The subject of nomenclature has always given trouble and is to a large extent still a state of flux. Steps have been taken by the A. S. T. M. to standardize names and it is hoped that the good work will go on.

The list is valuable for another purpose, namely, to check the so-called new mixtures which appear daily and to see whether they are not merely copies of old alloys which have been forgotten, at least by name.

A list of this sort must, in order to retain its value, be kept up-to-date. In its present form it is the most complete that has come to the attention of the editor. It is sincerely hoped that Dr. Campbell, who is pre-eminently fitted to handle this work, will find it possible to keep the list abreast of the times.

American Individualism, by Herbert Hoover, Secretary of Commerce. Published by Doubleday Page & Company, New York. Size 4½" x 7", 72 pages. Price payable in advance $1.00. For sale by THE METAL INDUSTRY.

This little book embodies Mr. Hoover's philosophy of individualism as opposed to such doctrines as socialism, communism, autocracy, etc. To him the ideal of American individualism is the principle of equality of opportunity. He makes no pretense of considering that all men are born or become equal. All that can be hoped for is the assurance of equality of opportunity and stimulation to service. The idea occurs over and over again that the only way to social justice and freedom is through enlightened organization in economic world. This is, of course, always to be controlled by the Government.

Mr. Hoover recognizes the equal dangers and reaction of radicalism. He states that the path of progress must lie along a preservation of individualism by the stimulation of initiation of our people.

Hendricks' Commercial Register of the United States. Published by S. E. Hendricks Company, Inc., N. Y., 31st (1923) edition, 2482 pages, 8½" x 11½". Price payable in advance $15.00. For sale by THE METAL INDUSTRY.

The new 1923 edition of the Register contains 150 pages over and above the 1922 edition. 125,000 changes and additions were made to the new edition.

The lists cover the electrical, engineering, machinery, building, manufacturing, chemical and other industries, together with all industries allied thereto. The lists are for the use of both buyers and sellers.

The recently sprung-up Radio-Trades have been thoroughly compiled and classified. Many old classifications have been thoroughly revised and re-grouped.

Over 18,000 products are separately classified with the name and address following of every manufacturer or producer, together with the trade name or brand (if any) and also essential facts regarding the products of many of the leading firms. These classifications are made of very easy reference by an admirable system of indexing and cross-indexing.

All the manufacturers and others included in the Register, besides being listed under all the products they handle, are also arranged in one alphabetical section according to name.

All brands, trade names and such like are arranged to name in one alphabetical list with the name and address of the manufacturer following.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. REARDON, Foundry; PETER W. BLAIR, Mechanical; LOUIS J. KROM, Rolling Mill; CHARLES H. PROCTOR, Plating-Chemical; R. E. SEARCH, Exchange-Research

CASTING ALUMINUM

Q.—We are having considerable difficulty in securing aluminum castings made from Virgin No. 12 alloy that will be free from porosity, and still be easily machinable.

In order to get a readily machinable casting, we have been using a No. 12 alloy with the addition of 2% zinc and 1% tin, but we find that while the machining qualities are improved considerably by the addition of a small amount of zinc and tin, it is extremely difficult to secure castings that are free from very small pin holes.

Kindly advise at once what recommendations you have to offer to overcome these difficulties.

We might add that the section of the castings that we are running is fairly thin so that our pouring temperature must be as high as 825° Centigrade and this higher temperature may account to some extent for the condition of porosity.

A.—When aluminum is poured at temperatures over 1,400 degrees Fahr., it is very hard to say just what happens, but the general results are porous castings. The temperature at which aluminum is cast is important, and it would pay to see that the castings are of sufficient thickness to be able to pour them at a temperature that will assure satisfactory castings. Before changing the section of the casting it would be well to experiment to get a suitable method of gating. If one gate will not correct the fault try another; a little cut and try with the gate and pouring temperature until you obtain satisfaction is recommended, and if you are not successful try a mixture of 92 aluminum, 4 copper and 4 silicon. Make an alloy of pure silicon and aluminum by melting 45 pounds of aluminum. Get the aluminum to a red heat and add 5 pounds of 99% silicon, pour into ingots and use as follows: Melt 84 pounds of aluminum and 8 of hardener made of half copper and half aluminum, and 8 of the silicon hardener. This metal has good fluidity and may answer your purposes.—W. J. R., Problem 3,154.

CASTING BRASS BOXES

Q.—We are having trouble with our driving box brasses, we will appreciate any suggestions that might be helpful in improving them.

We use Hawley Swartz Furnaces, 1,000 pounds capacity, our mixture is copper 83, tin 8, lead 5, zinc 2 and boron 2. We use ¼ per cent of 15 per cent phosphor copper.

We have cast the molds horizontal and perpendicular, with the same results, gating at the bottom with a good heavy riser; the mold is rammed just hard enough not to swell and is vented well, blacking is rubbed on by hand, poured at about twenty-three hundred temperature. Our charges are one thousand pounds. We use three wood blocks in charging and pole the metal, we use a reducing flame, just sufficient not to smoke, time of melting about one hour.

I am enclosing sample of the casting. These driving box brasses weigh 110 pounds.

A.—We should say that your trouble is in the method of handling the furnace. A mixture of 83 copper, 8 tin, 5 lead, 2 zinc, ¼ per cent phosphor copper, is one that should give very little trouble, and we suggest that you look your furnace over examining the tuyeres, especially the oil pipe. See that it is held in proper position and that the bottom is clean, no slag built up. Use 40 pounds oil pressure and 20 ounces air pressure. Eliminate the poling and use an iron rabbling iron. Use a neutral flame.

You will reduce your melting time and get a much better metal.

I would suggest that you read the article in the METAL INDUSTRY of June, page 217, "Gas Absorption and Oxidation of Non-Ferrous Metals." We would also suggest that you use ½ per cent 30 per cent manganese copper as a flux. Just before pouring add the flux, also a small handful of salt.—W. J. R. Problem 3,155.

COFFIN TRIMMINGS

Q.—What is a good mixture for die cast coffin trimmings?

A.—We will suggest a mixture known as C. T. or coffin trimmings, a mixture used extensively in the manufacture of coffin trimmings. It consists of 83 lead and 17 antimony. It is a very easy mixture to die cast or pour into permanent molds. The main advantage of this alloy is its comparatively low cost and easy casting properties.—W. J. R. Problem 3,156.

DIE CASTING METAL

Q.—We desire to procure an aluminum or die casting metal as a substitute for one of the parts of our product which we now cast in red brass.

In addition to reducing the weight of the piece, which is the primary reason for making a change, the substitute metal should be strong, ductile, readily machined, such as threading, drilling, etc., and be free from porosity so as to sustain a pressure of 50 pounds per square inch. We have tried pure aluminum and also various mixtures of aluminum and copper, finding aluminum is very difficult to machine, is more or less porous and the copper mixtures result in brittle castings.

A.—We do not know of any die casting mixture or aluminum mixture that will answer all your requirements. That is, the metal should be strong, ductile, readily machined and stand 50 pounds pressure per square inch. The strongest die casting white metal we know of with a zinc base consists of the No. 1 mixture: 88 zinc, 4 copper, 8 aluminum. This mixture is used for bearings, and the physical test shows it will run 35,000 unit stress pounds per square inch, 32,500 yield point, 14,700 elastic limit, and 09 elongation. Mixture No. 2 consists of 3½ copper, tin 7, zinc 89, and ½ aluminum. This metal is regular die casting metal and the physical test shows unit stress 30,000, yield 19,000, elastic limit 6,500 and elongation 2 per cent. The best aluminum mixture we know for such work as you describe consists of 96 aluminum, 2 magnesium and 2 copper.—W. J. R. Problem 3,157.

GAS FROM STRIPPING SOLUTION

Q.—I have a stripping solution composed of sulphuric acid and glycerine which is dangerous because of the explosive gas that comes off. What can I do for it?

A.—The gas that develops on top of your electro stripping solution is hydrogen. You can easily overcome the explosion of the hydrogen bubbles that is caused by the electric spark, that results when the positive and negative bars come in contact with each other, by inserting a cut out switch in the positive or negative line when taking out the articles that have been stripped. Throw out the current by pulling down the knife switch contact and no explosion can result just so long as no spark can be produced.—C. H. P. Problem 3,158.

NICKEL ON DIE-CASTINGS

Q.—What is a good nickel solution for die-castings?

A.—There is a firm in Chicago that specializes in die-castings. The solution for this work is prepared as follows:

Water	1 gallon
Double Nickel Salts	8 ounces
Common Salt	3 "
Sodium Citrate	3 "
Citric Acid	⅛ ounce

Voltage 4. Temperature normal.

Frames such as used in automobile tops are cut down with tripoli, colored with white lime composition, wiped clean, cleansed in a hot strong solution of soda-ash of not less than 8 ounces per gallon of water and ½-ounce sodium cyanide, then washed in water and plated.

We know this solution will plate die-castings. The cleaning is important. Caustic soda solutions must not be used. If the die-casting surface turns black or nearly so after cleansing, it will fail in the nickel every time. Use the method outlined, and you will not fail.—C. H. P. Problem. 3,159

PLATING AND STRIPPING STEEL

Q.—We are adding a new process to our factory which will necessitate the deposit of steel on copper etched or engraved plates. After using these plates for a time the steel coating must be taken off, the copper plate cleaned and a new deposit of steel applied.

We find that there is very little literature on this subject and we are writing you to see if you have any information as to literature or competent factories that might give us this information.

A.—In answer to your question covering the electro deposition of steel on copper etched or engraved plates, we are pleased to refer you to an article in two parts printed in THE METAL INDUSTRY in October, 1921, part 1, page 405. Part 2, November, 1921, page 441, entitled "Electro Deposition of Iron." A description of plating of iron and steel for steel facing electrotypes and repair work by W. E. Hughes, B.A. These articles should give you the data you desire.

The steel can be readily stripped from the copper surface when necessary by an electro acid strip. The plates to be stripped of the iron or steel become the anode; either carbon, lead or copper can be used as the anodes. A voltage of 5 to 6 may be used with a fairly strong current 20 amp. per sq. foot or upwards.

Solution No. 1:

Sulphuric Acid, 66%	1 gallon
Water	1 quart
Glycerine	1 oz.

Solution No. 2:

Water	1 gallon
Muriatic Acid	1 gallon

The plates to be stripped should be moved vertically or horizontally during the stripping operation to keep the solution in agitation on the surface of the plate.

It is advisable to use a double throw switch in connection with strip No. 1 so that the current can be readily thrown off before the plates are removed from the stripping solution. Hydrogen is evolved to a considerable extent and bubbles are formed which hold the hydrogen gas. A spark from contact with the negative current will explode them with a loud noise. The explosion is not a dangerous one and can be readily avoided by the double throw switch.—C. H. P. Problem. 3,160

REMOVING FIRE COAT

Q.—How can I take the fire coat off bronze?

A.—To remove the first coat or surface scale from the bronze prepare a solution as follows:

Water	1	gallon 160 to 180 deg. Fahr.
Sulphuric Acid	1½	pints
Bichromate of Soda	2	ozs.

After the fire coat is removed, then wash in cold water and immerse in undiluted nitric acid for a moment to bring out the true color of the bronze metal.

Then re-wash in water, immerse in a cyanide dip, to remove stain, then re-wash in water and immerse in a hot solution composed of either of the following materials:

Water	1 gallon
Polysulphide	1 oz.
Water	1 gallon
Sulphide of Barium	1 oz.

When a dark tone results upon the bronze, remove, wash in cold water and then immerse in boiling water for several minutes, dry out and when cool, scratch brush with a soft brass wire brush (dry).

The color should then be a light bronze shade. Sometimes it is necessary to give the bronze articles a second dip in the dips to bring up the desired color. The second dip must be accomplished quickly.

It may be necessary to dilute the dip 50 per cent. with water for the second dip, and use the solution cold. However, you can decide best by experiment.—C. H. P. Problem. 3,161

REMOVING ZINC FROM BRASS

Q.—We have as a result of our manufacturing process considerable scrap and borings that contain from 1 to 4 per cent of zinc. We make alloys in which there is no zinc present, and it appears that it would be cheaper for us to remove the zinc from some alloys and get the desired results than it would for us to build up the zincless alloys from virgin metals or new pigs. We have tried burning out the zinc, but due to the fact that our furnaces are not designed for this work, it does not seem to be economical.

Would you advise us of the best method to purify our alloys of zinc, so that we may introduce the best practice.

A.—The only way to purify the alloy of zinc is to burn out the zinc. This is best accomplished in a refining furnace. A reverberatory type is best suited, and should be about 15 feet long, 8 feet wide, shaped like a bottle with a stack 18 inches by 18 inches inside measurement and 80 feet high. By rabbling the metal when melted all the zinc can be eliminated. This is the only method that we know of that will take out the zinc.

In reference to briquetting machine for briquetting brass turnings, the Ronay process has been used for this work.—W. J. R. Problem. 3,162

VULCANIZING RUBBER TO STEEL

Q.—I have been doing considerable experimental work recently in trying to vulcanize rubber to steel. In his class of work it appears necessary first to plate the steel with a plating of some element or compound which has a high affinity for sulphur, as this is the most readily available element in the rubber by which a chemical union can be secured, and I find that some of the more common elements are not used in the plating business to any extent and consequently there is no handy and accurate data on them. Can you furnish me with a formula for a solution for the following elements for plating with electricity: Mercury, Bismuth, Lead, Cobalt, Iron, Manganese.

These solutions should be neutral as much as possible and be able to deposit a firm and chemically pure deposit of their respective metals.

A.—None of the compounds you mention will prove of any advantage as a factor in vulcanizing rubber to steel, so that it would be a loss of time to experiment with them.

The auto-truck rim manufacturers have found that an electro-deposit of brass from a cyanide solution gives the most satisfactory vulcanizing surface upon steel for solid rubber tires.

The following formula for a brass plating solution, which is quoted from Platers' Wrinkles, is used by rim manufacturers. In many instances the proportions are doubled to give rapid deposits:

Water	1 gallon
Sodium Cyanide	4½ ozs.
Copper Cyanide	3 ozs.
Zinc Cyanide	1 oz.
Bicarbonate of Soda	1 oz.
Ammonium Chloride	½ oz.

The solution should be run at normal temperature, 70 to 80 deg. Fahr., and at 5 to 6 volts.

If the anodes coat over in the brass solution with a basic zinc oxide, then very small proportions of caustic soda should be added to the solution, but not more than ⅛ ounce per gallon at one time. Repeat at intervals until the anodes clear up.

As a brightening agent one grain of powdered white arsenic dissolved in double its weight of caustic soda and a little warm water should be added per gallon of solution at intervals of one hour or more until the brass deposit becomes clear and bright. An excess of arsenic is always detrimental.

Anodes should be alloyed as follows: 80 per cent copper, 20 per cent zinc. Cast anodes give the best results.

The arsenic mentioned as a brightening factor may be replaced by chloride of antimony. A patent was obtained a few years ago for a brass solution containing antimony. It was claimed that the antimony was a factor in the brass deposit that gave the vulcanizing surface so much desired for steel. However, there is no advantage in the use of antimony. The amount that can be used in a brass solution is so infinitesimal, it could not be found in the brass deposit upon analysis. Arsenic or nickel will do as well.

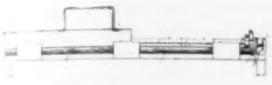
The rim manufacturers in Akron and Cleveland use the solution we have outlined.—C. H. P. Problem. 3,163

PATENTS

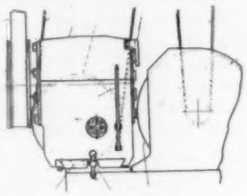
A REVIEW OF CURRENT PATENTS OF INTEREST

1,424,341. August 1, 1922. **Core Machine.** George William Combs, Leavenworth, Kansas.

The invention relates to improvements in core machines of the type employed in the manufacture of foundry cores, and one object is to provide a simple and inexpensive machine of this character whereby cores of different lengths and shapes can be rapidly and accurately produced at small cost.



1,425,331. August 8, 1922. **Grinding Machine.** Charles W. Olson, Detroit, Mich., assignor to Continental Motors Corp., Detroit, Mich., a corporation of Virginia.

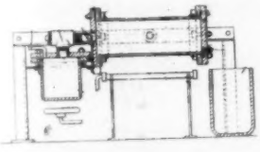


It is an object of the present invention to provide a grinding machine by which the heads of screws may be accurately ground at right angles to the threads of the screws and furthermore that this may be done continuously by providing rotating carrying devices which successively pass different ones of the screws across the grinding face of the grinding wheel employed to face the heads of the screws.

1,425,537. August 15, 1922. **Continuous Hot Mill.** Henry G. O'Brien, Warren, Ohio, assignor to the Trumbull Steel Co., Warren, Ohio, a corporation of Ohio.

This invention relates to improvements in hot mills for rolling metal, and is particularly advantageous in strip mills; the object is to render the mill more "flexible"—capable, that is to say, of producing strips of wider range, in the matter of thickness particularly, than otherwise can be got from a single mill installation, and this with greatest economy of speed, power, and floor space.

1,425,679. August 15, 1922. **Method of Producing Phosphor Metals.** Samuel L. Nicholson, Pittsburgh, Pa., assignor to Westinghouse Electric & Manufacturing Co., a corporation of Pennsylvania.



This invention relates to phosphor-metals, and, more especially, to an improved method of producing the same, the present invention being directed to a modification of the Demmler process, described in the patent to Demmler, No. 1,287,653, issued December 17, 1918.

1,426,435. August 22, 1922. **Polishing and Tumbling Barrel.** Frederick Winkler, Bloomfield, N. J.

A tumbling barrel comprising a polygonal inner shell, a polygonal outer shell, end walls, all combining to form a polygonal annular chamber, vanes extending from the end walls along the inner shell and part way across, these vanes being inclined circumferentially in the same direction, and vanes extending from the end walls along the outer shell and inclined circumferentially in the same direction, but opposite to the direction of inclination of the first mentioned vanes.

1,426,623. August 22, 1922. **Method of Making Brass and Similar Alloys.** William R. Webster, Bridgeport, Conn.

The method of making brass from scrap, which comprises a determination of a value of a physical characteristic of each of a plurality of samples of brass having varying known proportions of copper and zinc, determining a comparable value of the same physical characteristic of a sample of brass drawn from a molten furnace charge containing scrap brass, comparing those values to determine the composition of the last mentioned sample, and then adding to the charge of metal in the furnace sufficient copper or zinc to bring the mixture to the composition desired.

1,426,678. August 22, 1922. **Process of Producing Dense and Firmly-Adhering Tin Deposits.** Max Schlotter, Berlin, Germany.

A process of producing dense and firmly adhering tin deposits, consisting in adding a substance of capillary activity to a tin salt solution, and subjecting the same to the action of an electric current.

1,426,683. August 22, 1922. **Process for Coating Metal Objects with a Layer of Another Metal.** Otto Stalhane and Olof Oskar Kring, Djursholm, Sweden.

Process for coating objects of metal with a layer of another metal, characterized by the fact that a bath consisting partly of the metal with which the objects are to be coated, and partly of a suitable flux is kept in a molten condition by passing an alternating electric current through the flux, that the objects are first dipped in the flux, and afterwards when they have been sufficiently heated are plunged down into the metal bath under the flux, and passing said alternating electric current through both the flux and the metal bath.

1,426,769. August 22, 1922. **Process for Plating.** Geo. H. Pinney, South Manchester, Conn., assignor to the Williams Bros. Mfg. Company, Glastonbury, Conn.

The process of plating that consists in applying a removable cover to a portion of the article to be plated, then applying a plating resisting material to the article around said cover, then removing said cover, and then plating the uncovered portion of the article.

1,427,206. August 29, 1922. **Sand-Blast Apparatus.** John E. Green, Johnstown, Pa.

A sand blast apparatus comprising in combination, a sand hopper having an outlet, a valve body having a chamber into which said outlet discharges, a sliding gate for shutting off the hopper outlet from said chamber, said valve body having a hollow interior, means connecting the interior of said valve body and said hopper with a source of fluid pressure, a discharge conduit in communication with the interior of said valve body, a rotatable valve mounted in said valve body for controlling the flow of sand from said chamber, and means for rotating said valve to discharge accumulations of sand within said valve body.

1,428,041. September 5, 1922. **Process for the Separation and Recovery of Metals from Metal Alloys.** Guillaume Justine Kroll, Luxemburg, Luxemburg.

The method of separating and recovering metallic constituents from metal alloys (including impure metals), which comprises introducing an alkali-earth metal (including magnesium) into said metal alloys, forming thereby a compound of the alkali-earth metal with the metallic constituents to be separated, this compound having a different melting point from and a specific gravity not more than that of the main metal, and eliminating this compound from the remaining part of the metal alloy under treatment.

1,428,084. September 5, 1922. **Cleaner for and Method of Cleaning Metals.** James H. Gravell, Elkins Park, Pa.

A cleaner for metals consisting of clay and a compatible metal etching acid.

A cleaner for metals consisting of colloidal clay, a compatible metal etching acid, water, a filler, acetone, and an alcohol of higher boiling point than ethyl alcohol.

1,428,085. September 5, 1922. **Composition for and Method of Preventing Metal from Rusting.** James H. Gravell, Elkins Park, Pa.

A rust preventive coating for metals comprising an admixture of castor oil, ethyl alcohol and an alcohol boiling at a higher temperature than ethyl alcohol.

1,428,088. September 5, 1922. **Soldering Solution.** James H. Gravell, Elkins Park, Pa.

A soldering solution comprising zinc chloride, ammonium chloride and fusel oil.

1,428,170. September 5, 1922. **Process for Coloring Metallic Copper.** Frederick Laist, Frederick F. Frick, Ernest Klepetko and Lyndall P. Davidson, Anaconda, Mont., assignors to Anaconda Copper Mining Company, Anaconda, Mont.

In a process of producing a colored coating on cupriferous bodies including copper, the step which consists in subjecting a body to the action of a substantially concentrated aqueous solution of a copper salt.

1,428,563. September 12, 1922. **Cleaning and Plating Apparatus.** George W. Schweinsberg, Brooklyn, N. Y., assignor to U. S. Electro Galvanizing Company, a corporation of West Virginia.

In cleaning and plating apparatus the combination with a cleaning tank and a plating tank, of tracks passing therethrough and adapted to conduct electric current from the articles being treated in one of said tanks, means for supplying current to the electrolyte and means for automatically carrying the articles through said tanks along said tracks.

1,428,716. September 12, 1922. **Machine for Pickling Metal Plates and Blanks.** Reuben Stanley Smith and Edward W. Burgess, Milwaukee, Wis., assignors to A. O. Smith Corporation, Milwaukee, Wis.

In an apparatus for pickling metal plates or blanks, a line of vats, in combination with a conveyor provided with depending supports to carry the plates or blanks through the vats, means to feed the plates or blanks to the conveyor, and means to deliver the plates at the end of their travel.

1,429,131. September 12, 1922. **Purification of Metallic Solutions.** Samuel Field, London, England, assignor to the Metals Extraction Corporation, Ltd., London, England.

The process for the purification of a zinc salt solution from base metallic impurities, which comprises immersing in the solution zinc and another metal in contact, neither of which is identical with the metallic impurity to be precipitated and one of which is lower than zinc in the electrochemical series.

1,429,170. September 12, 1922. **Electroplating Barrel and Catcher.** Edward A. Severance, Burlington, Vt.

An electro-plating apparatus comprising in combination, a solution tank, anodes disposed within said tank at the side thereof, a rotatable barrel comprising end heads and a textile covering between said heads, said heads rigidly secured to a drive shaft mounted in said tank, cathode bars held within said barrel and in circuit with said shaft, movable brush means mounted on said tank and adapted to be contacted with said shaft, and a reticulated work catcher removably mounted within said barrel.

1,429,380. September 19, 1922. **Continuous Annealing Furnace.** Martin Van Marle, Dudley, England.

A continuous annealing furnace comprising a heating chamber, liquid seals for both ends of said heating chamber, an endless conveyor for the goods passing through said heating chamber and in slack loops through said water seals, and means for positively driving said conveyor at the same speed at both ends of the furnace, whereby the conveyor loops in the water seals are maintained.

1,429,438. September 19, 1922. **Electroplating Apparatus.** Fred R. Klaus and Harry William Kranz, Cleveland, Ohio, assignors to Hydraulic Pressed Steel Company, Cleveland, Ohio.

In an electroplating apparatus, a cleaner, pickling, washing and electroplating tanks and a continuous conveyor for carrying articles through the cleaner and into and out of the said tanks.

1,429,542. September 19, 1922. **Process of Drying Japanese Lacquer.** Yuji Shibata, Tokyo Fu and Yushichi Nishizawa, Tokyo, Japan.

An article of manufacture, comprising a Japanese lacquer preparation having therein a complex salt of metals and ammonium in the proportion of five to thirty per cent.

1,429,959. September 26, 1922. **Metallic Alloy for Repair Purposes.** Perry O. Melton, Aberdeen, S. Dak.

A repair metal consisting of the following ingredients combined in substantially the proportions stated, viz.: Zinc, 11 ounces, lead 1½ pounds, tin 1¾ pounds, copper 1 ounce.

1,430,039. September 26, 1922. **Pickling Apparatus.** Wm. J. Stoop, Wheeling, W. Va.

A pickling apparatus comprising a tank, trackways carried by the side walls of said tank, a carriage permanently mounted for travel on said trackways and including U-shaped hangers depending within the tank, a plate-carrying rack adapted to be bodily lifted into and out of seated relation to said hangers and means for producing reciprocatory travel of said carriage.

1,430,054. September 26, 1922. **Sheet-Metal Plating or Coating Machine.** Nicholas Camelo, Rome, N. Y., assignor by direct and mesne assignments of one-third to Ida Jane Bliss, Utica, N. Y., and one-third to Mary L. E. Johnson, Camden, N. Y.

A machine for coating sheet material comprising means for advancing the material through the machine and means including an element disposed laterally with respect to the material and actuated by contact with the forward edge of the same to cause application of the coating substance thereto.

1,430,063. September 26, 1922. **Polishing Holder.** Conrad J. Diesel, and William C. Jackson, Cincinnati, Ohio, assignors to the Corcoran Victor Company, Cincinnati, Ohio.

In combination, a work holder and means for mounting the same adjacent a burnishing wheel or the like, comprising an overhead support, connected to the holder so as to permit it to swing thereon, and a treadle permanently connected to a floor or base, and having a member pivotally secured to it and to the work holder at a point out of line with the overhead support and at such an angle that a depression of the treadle will move the holder in a substantially horizontal path toward the wheel or the like.

1,430,886. October 3, 1922. **Apparatus for Polishing Metal Articles.** Richard Francis Dalton, Ansonia, Conn.

Apparatus of the character described comprising a rotary member carrying a buffing or polishing element against which is held the article to be polished, and means for directing sand or like polishing or abrading material onto the polishing element, said means consisting of a receiver located above said polishing element having a discharge orifice or nozzle, means within the receiver for positively conveying the sand or like polishing or abrading material to said orifice or nozzle, a container located below the polishing element for receiving the polishing or abrading material and conveying and elevating means for positively removing the material from the container and returning it to said receiver.

1,431,113. October 3, 1922. **Composition White Metal.** Chas. E. Hansen, Providence, R. I.

The composition white metal composed of copper, nickel, zinc, tin and cobalt in substantially the proportions herein described.

1,430,855. October 3, 1922. **Apparatus for Automatically Electroplating Metallic Sheets by Means of a Revolving Cylinder.** Max Schlotter, Berlin, Germany.

An electroplating apparatus, comprising, in combination an electrolyte container, a revoluble cylinder having its lower portion within said container, an anode in the container concentrically disposed relatively to said cylinder, means carried by said cylinder for receiving the article to be plated, means carried by the container for engaging the article to be plated and retaining the same on the cylinder during its passage through the container, and means for electrically connecting the cylinder with a source of current.

1,430,858. October 3, 1922. **Electrically-Heated Furnace.** Chas. Wm. Speirs, Battersea, London, England, assignor to Morgan Crucible Company, Ltd., Battersea Works, Battersea, London, England.

An electrically heated melting furnace provided with a plate for supporting a crucible, said plate being carried through the medium of a centering device by means attached to the base of the furnace casing.

1,431,300. October 10, 1922. **Process of Treating Metal Surfaces.** Herbert G. Grant, Attleboro, Mass., assignor to S. O. Bigney & Company, Attleboro, Mass.

An improved method of producing an ornamental effect on metal surfaces, which consists in electrically depositing a plurality of layers of metal films upon a metal plate, covering that portion of said plate with a protecting material between each two applications metal films which is to be preserved in the design, subsequently removing the protecting material and forcing or pressing portions of the layers below their normal or deposited surfaces and raising protecting portions of metal between said depressed portions.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

POLISHING AND BUFFING LATHE

The Connecticut Dynamo & Motor Company of Irvington, New Jersey, have placed on the market a new belt-driven polishing and buffing lathe, which they designate as their No. 86.

The novel feature of this machine is that it has a revolving cover which can be set so that the belt may be run from any angle, permitting the machine to be belted direct from a line shaft mounted either on the ceiling, on the floor behind the lathe, or on the ceiling of the floor below. This protects the operator from the belt and pulleys and prevents the work from coming in contact with the belt. This cover carries the belt shifter so that the shifter is always in the proper position with respect to the belt.

CONNECTICUT BUFFING AND POLISHING LATHE

The machine is equipped with ball bearings of the SKF, 2 row type. The spindle is long, the wheels being placed well away from the frame allowing free movement of the work around the wheels. The shaft is made of a special alloy steel which has great rigidity and strength.

The net weight of this machine is 650 pounds. The weight is so distributed as to prevent vibration.

This lathe is intended for heavy duty and may be used with large wheels on heavy work. The following is the specifications of the lathe as furnished by the manufacturers:

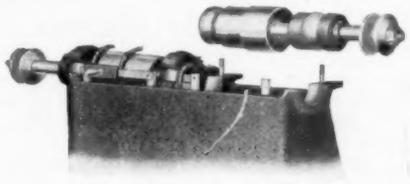
SPECIFICATIONS

Length of spindle overall	48″
Diameter of spindle between bearings	2″
Diameter of spindle in bearings	1.77″
Diameter of spindle between flanges	1¼″
Bearings—2 row S K F	No. 1309
Distance between wheels	36″
Diameter of flanges	6″
Tight pulley—6″ dia. x 4½″ face	
Loose pulley—5¾″ dia. x 4¼″ face	
Maximum wheel, thickness	4″
Height to centerline of spindle	38″
Size of base at floor	20″ x 24″
Net weight in lbs	650
Shipping weight in lbs	750

BALL BEARING POLISHING MACHINES

The Mitchell Engineering Company of Springfield, Ohio, is offering to the trade a line of ball bearing polishing and buffing machines, the installation of which, it is claimed, will not only be conducive to greater output, but will actually pay for themselves in economies effected, in some instances in less than a year's time.

This company states that it has been demonstrated beyond a doubt that ball bearing polishing and buffing machinery is more economical in service than any of the plain bearing types, as aside from very considerable saving in power consumption, as well as lubricant, the ball bearing machine is also of many times greater longevity, the life of ball bearings in our installation being upwards of six years of continuous daily operation in many instances. Further when renewal or replacement of bearings is desired, these may be replaced in a fraction of the time required to replace plain or babbitted bearings, thus eliminating lengthy shut-downs, especially when production is required. Also, as there is no wear on the spindles of ball bearing machines, as is the case with the plain bearing type, the spindles will last as long as the machine without replacement or renewal. To reduce further loss of production, and simplify the matter of replacing bearings, a peculiar construction, permits removal of the spindle with the bearings by releasing two nuts on the bearing housing clamp. The user may provide himself with extra spindle with bearings mounted. To insert this spindle in machine can be accomplished by anyone, as the ball and socket feature of bearing housing absolutely guards against misalignment or binding of the spindle or bearings.



REMOVING SPINDLE WITH BEARINGS

MITCHELL BALL BEARING POLISHING AND BUFFING MACHINE

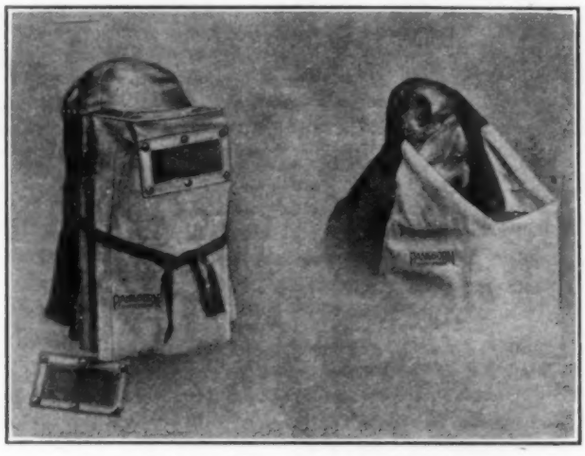
NEW STOP-OFF MATERIAL

F. Thornton, 629 E. Main street, Waterbury, Conn., has put on the market a new acid resisting material for the use of etchers, platers, sign and stencil makers, etc. It is claimed that this material is superior to ordinary resists, that it is more effective and lasts longer and that it can be used for very fine and intricate designs and can be applied with camel hair pencil or brush. It is stated that this material successfully resists potash, alcohol, ammonia and all acids and materials used on metals and glass. Can be easily removed afterward.

BLAST APRON AND HOOD

The use of steel shot and grit as an abrasive for sandblasting, is increasing among foundrymen generally. The metallic abrasives have 2½ times the specific gravity of sand, and strike a blow in proportion without disintegration, as is the case with sand.

The rebound of the abrasive is correspondingly more wearing on operator's hood and clothing. To meet the need of something to withstand this greater force of the metallic abrasive the Pangborn Corporation, Hagerstown, Md., has just placed on the market a "Shotpruf" apron and hood.



PANGBORN 'SHOTPROOF" HOOD

The front of the apron is made of chrome leather and protects fully the operator's clothing. It is held to the operator's legs securely by means of spring clips, without binding the legs, and permitting the apron being easily and quickly put on or removed.

The hood also has a chrome leather front and crown that resists wear. A finely woven wire extra heavy sight screen that can be easily and cheaply replaced protects the operator's eyes and permits clear vision. The hood is made with an adjustable head band to fit any size head.

PANGBORN 'SHOTPROOF" APRON

LIQUID SULPHUR

The proper method of using "Liquid Sulphur," which is made by the Sulphur Products Company, of Greensburg, Pa., is as follows:

To get 100 per cent efficiency out of "liquid sulphur" have your work chemically clean before immersing in oxidizing solution—same as for plating. Shake well before using.

Make all solutions weak to start—then strengthen if necessary. You may make some change in the following directions to suit your requirements.

For ordinary oxidizing: one teaspoonful "liquid sulphur" to each gallon of water.

For oxidized copper finish: use water cold.

For oxidized silver finish: use water hot.

For enamel gloss oxidized copper finish: have work well polished and buffed. Place in oxidizing solution of one teaspoonful "liquid sulphur" to each gallon of cold water. Leave in solution only long enough to produce desired colors. Rinse in cold water, then in hot water. Dry in sawdust or oven. Brush dry with steel wire wheel for a more lustrous finish. Relieve with small buff wheel using coloring compositions. Wipe with clean cloth and lacquer.

For Antique Copper Finish: polish and buff the work. Coloring not necessary. Clean as for oxidized copper. Copper plate ten or fifteen minutes. Oxidize in "liquid sulphur" solution. Scratch-brush with a little pumice wherever copper is to show. Rinse in cold water. Dry in hot water and sawdust. Lacquer. Dead lacquer gives better finish.

For oxidizing brass: Brass work must first be given a preliminary "flash" in copper. Then treat same as for oxidized copper finish.

For oxidizing steel: Steel like brass must first be given a light copper plate. For dead black or gun metal finish, a light plate of copper is sufficient. For oxidized copper finish or effect, the copper plate must be more substantial so that the scratch-brush or buff will not cut through when relieving.

For oxidizing rough iron castings: One teaspoonful "liquid sulphur" in cold water. Rinse after oxidizing in cold water, then in hot water. Place in drying oven.

For oxidizing bronze: make oxidizing solution very weak. Scratch-brush on fine brass wire or steel scratch-brush. This will give iridescent colors on work when taken from oxidizing solution.

AMERICAN MANGANESE BRONZE EXHIBIT

In the December issue of THE METAL INDUSTRY, on page 471, the Marine Show was described. The exhibitor of the American Manganese Bronze Company, of Philadelphia, Pa., was inadvertently omitted. It consisted of the following:

1. A large bronze propeller wheel blade, such as they have made hundreds of, for the large merchant ships.
2. Small propeller blades, bent almost double, in order to show the great ductile qualities of their special metal "Hy-ten-sl Bronze." Hy-ten-sl is the strongest bronze known.
3. Other smaller and intricate pieces of casting work.
4. Castings of various metals, made by the "new centrifugal method" of the American Manganese Bronze Company, known as the "Janney" method.
5. Samples of various acid resisting bronzes.
6. Installation photos of propeller wheels, large castings, etc.

ESCOLITE

When the Electric Smelting & Aluminum Company, Inc., of Lockport, N. Y., first began the manufacture of detergents, the production and marketing of them was easily handled by the same organization that was doing like service in the company's other field, the smelting and alloying of non-ferrous metals. Today the distribution and servicing of the products first mentioned, i. e.: Alumina Soapalite, Escolite, Sol-Esco, Esco Mineral Cleaner, Escolite Mineral Cleaner, Escolite Aluminum Cleaner, and others requires a large organization of trained specialists. They feel this will best serve our customers' interests by functioning as a unit separate and distinct from the manufacturing company.

To that end, there has been organized and incorporated the Cowles Detergent Company, Lockport, N. Y., which, beginning January 1, 1923, will, under arrangement with the Electric Smelting & Aluminum Company, Inc., manufacturers, undertake the distribution and service to customers of the products mentioned.

The same salesmen who now represent the above products continue in that capacity with the new company.

A CRUCIBLE NEW YEAR

Happy New Years were broadcasted in all sorts of fashion with the advent of the year 1923, but it remains for A. L. Haasis, Manager of the Crucible Department of the Joseph Dixon Crucible Company of Jersey City, N. J., to make crucibles a part of his New Year's Greetings.

THAT YOU HAVE THOUGHT LESS OFTEN OF "ME & DIXON" THESE LAST 365 DAYS THAN "I & DIXON" HAVE BEEN THINKING OF YOU, IS DUE SOLELY TO THE FACT THAT "I & DIXON" HAVE HAD SO MUCH MORE TO ATTEND TO THAN HAS BEFALLEN YOU IN YOUR HAPPY LOT.

AND SO THE OLD ADAGE IS PROVEN, - I.E., IF YOU WANT A THING DONE ASK SOME ONE WHO IS BUSY TO DO IT FOR YOU.

SO IF YOU WANT CRUCIBLES THAT WILL MAKE YOUR LIFE STILL MORE RESTFUL BE SURE AND GET DIXON'S, FOR DIXON IS A BUSY PEOPLE, AND ONLY BUSY PEOPLE CAN FIND TIME TO MAKE THE BEST.

GENUINELY YOURS
A. L. HAASIS

JANUARY 1ST, 1923.

HAPPY NEW YEAR FROM A. L. HAASIS.

Above is the New York announcement of Mr. Haasis, who, among his accomplishments, is an experienced crucible salesman and an art collector.

MAJOR METAL

Major Metal is a new white metal, having, it is claimed, much greater strength than aluminum and excellent machining qualities. It has a specific gravity of 2.71. It remelts at about 1,250° F. and should be poured at temperature between 1,250° F. to 1,300° F., where it flows easily. Pouring at higher temperature causes a tendency to porosity. Shrinkage is ¼ inch per foot for sand casting, for die casting .008 inch per foot. It is claimed that it machines easily, using high cutting speed and low feed, using tool with round shape cutting edge; use kerosene. It takes a clean, strong thread; can be forged, and rolled cold or hot up to about 800° F.

In heating Major Metal for forging or rolling, heating temperature should never exceed 900° F. Rubbing with a kerosene cloth before each time it is put through the rolls will greatly facilitate rolling; can be welded, soldered, spun and cast.

Tests made at Robert W. Hunt & Company, Armour Institute, Studebaker and Midwest Engine Company show a tensile strength, in the cast bars, of 30,000 pounds; elongation, 6 per cent; reduction of area, about 10 per cent. The tensile strength increases with hammering, forging, stamping, pressing and rolling; and it has a considerable amount of spring not existing in other alloys.

The manufacturers claim that Major Metal takes and retains a high polish without tarnish or corrosion, is not affected by the elements and resists acids, except hydrochloric; that tests have been successfully made in boiling catsup, fruit acids, chili sauce, vinegar, lactic acid, salt brine, ammonia, strong soap, lye, different water conditions for alkali tests, different atmospheric conditions.

This metal does not compete with aluminum, as the cost is higher, but the claim is that it does things that cannot be done by aluminum, and the market has been where a homogeneous, non-corrosive, acid-resisting, strong metal is required.

Hardness of Major Metal castings, No. 11, scleroscope.

Hardness of Major Metal rolled material from No. 20 to No. 27 scleroscope (No. 27 equals hardness of rail steel).

It is sold by the Major Engineering Corporation, 10 South La Salle street, Chicago, Ill.

EQUIPMENT NOTES

Balbach Smelting & Refining Company, whose large works are located at Newark, N. J., and whose offices are at 280 Broadway, New York, is featuring a line of copper, brass and composition ingots, antimonial and desilverized lead, white metals, gold, silver, platinum, palladium, copper sulphate, etc.

The Ajax Metal Company, Philadelphia, Pa., announces that there are over 250 Ajax-Wyatt furnaces in use here and abroad, melting 2,500,000 pounds of metal daily.

The Marcy Mill for grinding foundry wastes and the Wilfley Table for separating the metal from waste material are being featured by the Mine & Smelter Supply Company, 42 Broadway, New York, which sends out a list of foundries and brass mills in which this equipment has been installed.

Mackintosh-Hemphill Company, Pittsburgh, Pa., which recently took over the A. Garrison Foundry Company, is calling attention to the 28" motor driven aluminum mill which completes all rolling operations from the ingot to the finished sheets.

The Seymour Manufacturing Company, Seymour, Conn., announce in this issue a reduction in prices on Seymour nickel anodes of all sizes and shapes.

The War Department on January 23rd will hold a sale at Philadelphia, Pa., of 50,400 pounds of platinum mass containing 1190 troy ounces of pure platinum. This announcement appears on another page.

The Kenworthy car type non-oxidizing annealing furnace is reported by Charles F. Kenworthy, Inc., engineers and builders, Waterbury, Conn., to have been installed recently in many prominent brass shops including Detroit Copper & Brass Rolling Mills, Detroit, Mich.; Illinois Wire and Cable Company, Sycamore, Ill.; General Electric Company, Schenectady, Pittsfield and Baltimore plants; American Brass Company, Waterbury and Ansonia plants (three, not completed); Western Cartridge Company, E. Alton, Ill., (two open type); Chase Metal Works, Waterbury, Conn.; American Enamelled Magnetic Wire Co., Muskegon, Mich., (second installation). An order was recently received from Belden Manufacturing Company, Chicago, for a heavy duty double chamber rotating type non-oxidizing annealing furnace.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

BRASS MANUFACTURERS

HEADQUARTERS, c/o W. M. WEBSTER, CITY HALL SQUARE BLDG., CHICAGO, ILL.

Generally speaking, the members of the National Association of Brass Manufacturers have had as favorable a year as can be expected under the circumstances.

They view with a great deal of alarm, the labor situation for in its present arbitrary and restricted attitude, if carried on through 1923, building will be nil, men idle, business poor, prices bad and profits out of the question.

There is no opportunity of relief in that direction from Europe. The one hope of the American merchant and manufacturer is the encouragement and immediate expansion of the Apprentice System.—W. M. Webster, Commissioner.

INSTITUTE OF METALS DIVISION

HEADQUARTERS, 29 W. 39TH STREET, NEW YORK

The annual meeting of the Institute will be held, as customary, in New York, on February 19, 20 and 21, and it is expected that this meeting will draw together as large a group of members as attended the annual meeting last February. The details have not been fully arranged, but the program promises to be quite as interesting as last year.

Doctor Walter Rosenhain, head of the metallurgical department of the National Physical Laboratory at Teddington, England, will lecture before various universities and societies in the East. He comes here under the auspices of the Institute of Metals Divison, before which body he will deliver their second annual lecture on Monday, February 19, at 4 P. M., in the auditorium of the Engineering Societies Building, 29 West 39th Street, New York City. The subject will be "Solid Solutions," with which he expects to deal along theoretical and fundamental lines.

The following are the subjects of the lectures to be delivered before various universities and organizations:

1. Hardness and Hardening.
2. The Structure and Constitution of Alloys (Before Franklin Institute, February 15).
3. Strain and Fracture in Metals.
4. Aluminum Alloys.
5. Metallurgical Research at the National Physical Laboratory, England.

BRITISH INSTITUTE OF METALS

HEADQUARTERS, 36 VICTORIA STREET, LONDON, ENGLAND

The British Institute of Metals is offering Student Members very favorable terms—in fact, they lose on them financially until they are transferred to the Member Class. The next election of Student Members and of Ordinary Members takes place on December 14. Membership Application Forms and literature regarding the Institute can be obtained on application to the Secretary.

COPPER AND BRASS ASSOCIATION

HEADQUARTERS, 25 BROADWAY, NEW YORK

At the second annual meeting of the members of the Copper and Brass Research Association, held December 5, 1922, at the offices of the Association, 25 Broadway, New York, the following were among the directors elected to serve for the ensuing year, the first mentioned being a member of the Executive Committee:

F. S. Chase, president, Chase Rolling Mills; Edw. H. Binns, president, C. G. Hussey & Company; H. J. Rowland, Sales Manager, Rome Brass & Copper Company; Henry F. Bassett, President, Taunton-New Bedford Copper Company; Carl F. Dietz, president, Bridgeport Brass Company; B. Goldsmith, president, National Brass & Copper Company; E. O. Goss, president, Scovill Manufacturing Company; U. T. Hungerford, president, U. T. Hungerford Brass & Copper Company; A. E. Seelig, manager, Michigan Copper & Brass Company.

The directors, at an organization meeting immediately following the annual meeting, elected the following officers:

President, R. L. Agassiz, vice presidents, C. F. Kelley, F. S. Chase, E. J. Rowland, Walter Douglas and U. T. Hungerford; treasurer, Stephen Birch; secretary, G. A. Sloan; and manager, William A. Willis.

In connection with the conclusion of the first full year of the association's activity as an unincorporated, voluntary organization of the Brass and Copper industries R. L. Agassiz, president of the Calumet and Hecla Mining Company, who is president of the Copper and Brass Research Association, said:

"The underlying purpose of this whole effort is to develop to the maximum the domestic consumption of the metal. Export trade will always be a large factor, but it will be possible, we believe, to so augment the American use of the metals that the varying industrial pulse of Europe will be much less influential in determining the prosperity of the industry.

"In this connection, it is interesting to note that while the 1922 consumption of copper and brass in the building industry in this country was about 150,000,000 pounds (an increase of over 100,000,000 pounds as compared with 1921), yet, the potential market for copper and brass in the building industry is placed at approximately 650,000,000 pounds annually."

AMERICAN FOUNDRYMEN'S ASSOCIATION

HEADQUARTERS, 140 SOUTH DEARBORN ST., CHICAGO, ILL.

The American Foundrymen's Association with the ending of 1922 has completed another year showing ever increasing activities for the benefiting of the foundry industry. The Rochester convention marked an epoch in the history of the Association when the first European papers were presented as a result of an agreement for an annual exchange of papers with the leading foundrymen's associations of Europe. Papers were read by representatives of the Institution of British Foundrymen, the Belgian Foundrymen's Association and the French Foundry Technical Association.

Without doubt the most important undertaking of the Association for many years past was in the organization in cooperation with the Division of Engineering, National Research Council, of an investigation of molding sand problems. This committee composed of some forty members includes in its personnel representatives of the various governmental bodies. Much progress has already been made in the development of foundry sand testing methods, of reclamation

The second annual lecture of the Institute of Metals Division will be given by Dr. Walter Rosenhain of the National Physical Laboratory, England. Doctor Rosenhain will talk of Solid Solutions, a subject that is of decided interest.
processes and in interesting state Geological Survey departments in making surveys of foundry sand deposits.

The Association has added to its list of publications a bimonthly bulletin known as the bulletin of the American Foundrymen's Association. The purpose of the bulletin is to keep members informed of all the Association's activities, report committee progress and to furnish abstracts of current foundry literature. It is expected that the abstracts will provide a complete file of references to any foundry subject.

This Foundry Code, sponsored by the American Foundrymen's Association and the National Founders' Association, has just been adopted as a national standard by the American Engineering Standards Committee.

Closer relations have been established with the American Society for Testing Materials and A. F. A. members have been appointed on all the A. S. T. M. committees which are

considering standards and specifications which are of interest to foundrymen.

EXHIBITION IN 1923

The next Exhibit in conjunction with the Annual Convention of the A. F. A. will be held in Cleveland, April 28th to May 3rd, 1923.

For the information of all and in answer to inquiries received, exhibit prospectus containing rules and regulations, floor plans and application blanks will be mailed to all about the middle of January.

Exhibition Hall and the Arena in Cleveland's new Public Auditorium will provide an attractive setting for exhibits, with accommodations for installing and operating practically all classes of exhibits that have been shown in previous years. Alternating current at 230 volts, three wire three phase, and direct current at 115 and 230 volts, compressed air, gas, and water connections will be available.

Because of the character of the building, it will be necessary to insist that exhibitors furnish the management with detailed information as to plans for operating, and use great care in the installation and removal of exhibits.

Exhibitors are requested to give this matter careful consideration and be prepared to file application promptly after floor plans are received, giving complete information as to your requirements and plans.

AMERICAN ELECTRO-PLATERS' SOCIETY

HEADQUARTERS, CARE OF F. J. HANLON, 292 GEORGE STREET, CHICAGO, ILL.

In reviewing the Electro-Plating Industry for the year of 1922, the writer, like many others, gives thanks that we have passed safely through a year of many trials, with some success. At the outset of the year the writers' attention was called to the prediction of some great compiler of statistics that the wooing of prosperity, would be one of many disappointments, and he said as I remember it, that it would spread over our great country, like the spots of a leopard, these spots increasing in size, until they met or formed a blanket of complete activity all over the United States of America.

In my capacity, as the Secretary of the American Electro-Platers Society, I have had an opportunity to make observations of the activity in our branch of the reorganization of industry, also making comparisons, with the above quoted predictions. It appears that the prosperity in our business that was very apparent in the East, during the year of 1921, was not so prevalent, but the Middle West, was the reciprocant of many favors from the God of Fortune, and 1922 was the best year for the members of the A. E. S. in this section of the country since the close of the World War.

The start of the New Year gives promise of continuing it indefinitely, and we feel that the temporary set back of our eastern brethren will soon be over. Reports justify the prediction that soon the wheels of industry, for the A. E. S. members will soon be humming, all over this country.

During the last three months, of the year we had inquiries for more men than at any period during the year, and they are still coming in, so I feel safe in saying that I know that the year of 1923, will be one of the greatest if not the greatest in the history of this Society.—F. J. HANLON.

ST. LOUIS BRANCH

HEADQUARTERS, CARE OF H. H. WILLIAMS, 4156 BOTANICAL AVE.

In celebrating our Tenth Anniversary on Saturday, January 13th, an educational session was arranged for 3:30 p. m. sharp, at which time a paper was read on "The Physical and Chemical Properties of Steel" by Mr. Guy White, Chemist and Assistant Superintendent of the National Enameling & Stamping Company. This subject and others were open for questions and discussions.

This was followed by the usual banquet, entertainment and dance, beginning at 6:30 p. m. sharp. The ladies were entertained during the afternoon meeting.

PROVIDENCE-ATTLEBORO BRANCH

HEADQUARTERS, CARE OF C. J. POYTON, 269 OHIO AVENUE

The annual banquet of the Providence-Attleboro Branch has been postponed to January 20, 1922.

NEWARK BRANCH

HEADQUARTERS, CARE OF ROYAL F. CLARK, 71 CHADWICK AVENUE

On December 1, 1922, they held a "Get Together Dinner," which was a great success. They intend to have them every month or once every two months. There were three speakers, C. H. Proctor, Van Winkle Todd, president of the Hanson Van Winkle Company, and Dr. H. Meyers.

BRIDGEPORT BRANCH

HEADQUARTERS, CARE OF DAVID FLEMING, 97 ROOSEVELT STREET

The Bridgeport Branch of the American Electro-Platers Society held their regular monthly open meeting in their laboratory at 269 St. John street, Bridgeport, on Friday. The speaker of the evening was Walter A. Graue, representative for eastern and northern Connecticut for the Magnus Chemical Company of Brooklyn, N. Y.

The subject of the evening was cleaning materials, equipment and scientific methods of preparing metal surfaces for electro-plating.

NEW YORK BRANCH

HEADQUARTERS, CARE OF J. E. STERLING, 468 GRAND AVENUE, LONG ISLAND CITY, N. Y.

This branch is again looking forward to the coming banquet which will be held February 17, 1923, at the Aldine Club, 200 Fifth avenue, New York City.

The various committees, of which William Fischer is chairman and William Voss, publicity and booklet chairman, are striving to make this banquet the best ever. No expense is spared to make it so. Some new features in the way of souvenirs and entertainment will be presented.

The afternoon session will be conducted by C. H. Proctor and each branch has been asked to contribute one paper of interest. The various papers will be discussed, and both topic and verdict will be published.

The ladies' committee will entertain the ladies, while the members and their friends are at the session.

An especially fine dinner has been arranged for, after which dancing will be the main feature.

Each year finds this branch becoming more and more popular; the constantly increasing attendance at the banquets and the increased interest shown at the various sessions proves that this branch has hit upon the right idea.

Devoting several hours to plating and its kindred problems in the afternoon session, and then the rest of the time for good fellowship and a good time, is certainly and ideal way to handle such a banquet, and the New York Branch should be congratulated for setting such an example. Tickets are $4 each and can be obtained from William Fischer, 300 St. Ann's avenue, New York, N. Y.

AMERICAN ELECTROCHEMICAL SOCIETY

HEADQUARTERS, COLUMBIA UNIVERSITY, NEW YORK

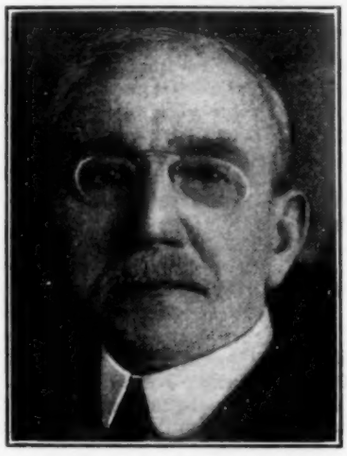
Great progress has been made during the past year towards the rationalization and standardization of electroplating practice and a number of valuable contributions on the subject were submitted by the laboratories of the Bureau of Standards, of Columbia University the Massachusetts Institute of Technology, the University of Wisconsin and others. Those members of the Society who are particularly interested in electroplating and electrolytic refining organized the Electrodeposition Division of the Society for the purpose of close co-operation in the promotion of this branch of electrochemistry. George B. Hogaboom is chairman of the Division, C. S. Witherell vice-chairman, and William Blum, Bureau of Standards, Washington, secretary-treasurer.

The fall meeting 1923 will very likely be held in one of the western cities. A tentative plan includes a visit to the foremost industrial towns situated on the Great Lakes. The technical program of this meeting includes two sessions on the "Progress in Electrolytic Refining." Mr. Francis R. Pyne who will be in charge of these two sessions has already outlined a highly interesting schedule including dissertations on the refining of copper, tin, lead, nickel, iron and zinc. Papers and discussions are not confined to members.

Personals

FIFTY YEARS IN THE BRASS BUSINESS

In January, 1922, THE METAL INDUSTRY had the pleasure of publishing the portrait and career of U. T. Hungerford, who had rounded out a half century of activity in the brass business, and we commented at that time of the number of fifty-year Captains of Industry that we have mentioned in our past issues.



EDWARD LAURENS FRISBIE

These Captains or Generals included such Connecticut men as Chauncey Goss, Mark L. Sperry and Charles F. Brooker.

We have now the pleasure of presenting another resident of Connecticut; in fact a native of the Brass City itself (Waterbury), who has passed the fifty-year mark of continuous effort in the manufacture of brass.

Edward Laurens Frisbie, Jr., who has just rounded out his fiftieth year in connection with the brass industry of Waterbury, at present being senior vice-president of the American Brass Company, has taken an important part in shaping the later history of the city and in promoting the further growth of its mammoth industrial interests.

He was born in Waterbury, November 22, 1854, the son of Edward Laurens and Hannah Frisbie. The father was of Welsh ancestry, being a direct descendant of Edward Frisbie, who in the early part of the seventeenth century left Wales and joined the Hartford colony of Connecticut. In 1644 he was one of those who purchased Totoket, now Branford, and organized a town government there. One of his descendants, Elijah Frisbie, in 1750 removed to Waterbury and founded the branch of the family of which Edward L. Frisbie is the representative.

In 1847 Edward L. Frisbie, Sr., abandoned farming to become an employe in the kettle department of the Waterbury Brass Company. In the spring of 1849 he engaged in casting brass and German silver at the factory of Brown & Elton, and when the firm of Brown & Brothers was organized he was offered and accepted the management of the casting department and remained with that house for thirty years. He was among the pioneers in the development of the brass industry of Waterbury and New England and played an important part in writing his chapter of the city's history. He also became an influential factor in financial circles as president of the Waterbury Savings Bank, a trustee of the Dime Savings Bank and a director of the Manufacturers' National Bank, and also its president.

Edward L. Frisbie, Jr., after attending the public schools of Waterbury continued his education in the Williston Seminary at Easthampton, Mass. He made his initial start in the brass business as an office employe with Brown & Brothers in 1872, occupying a responsible position with that house for twelve years. This firm was acquired by Randolph & Clowes. In 1884 he entered the employ of the Benedict & Burnham Company. Since then he has remained with that concern, which later became part of the American Brass Company, a term of thirty-eight years which with the previous twelve years with Brown & Brothers rounds out his fifty years activity in brass.

In 1885, on the death of G. W. Burnham, he was elected secretary of the company, and on the death of E. L. Bronson succeeded to the position of treasurer in July, 1890. He was made president in 1896 and so continued until 1912, when the Benedict & Burnham company, the stock of which had long been owned by the American Brass, at that time ceased to exist as a corporation. He remained in charge of the Benedict & Burnham branch until December, 1917, when he withdrew to devote his time to the general interests of the American Brass Company, becoming senior vice-president of that concern. He was also, from 1891 until 1892, secretary, president and treasurer of the Watch Company of Waterbury.

He is also president of the American Metal Hose Company and a director of the Colonial Trust Company. He married, on December 5, 1878, Miss Nellie Lynde Dickinson, and they have one daughter, Helen. The family attend St. John's Episcopal Church, and in politics Mr. Frisbie maintains an independent course. He served on the Board of Finance under a Republican mayor, John P. Elton, and also under a Democratic mayor, Martin J. Scully. He belongs to the Waterbury and Country Clubs, and to the Union League Club of New York City.

FIFTY-SEVEN YEARS OF SERVICE

Fifty-seven continuous years of active service with the same company was the remarkable record of James B. Cummings of Torrington, who recently was released from the employ of the Turner & Seymour Manufacturing Company, by which concern he had been engaged since 1865. He was for twenty-five years in the plating department, of which for a time he was the foreman. Subsequently he worked in the pole finishing department and also as assistant shipping clerk. Of late years he had been in charge of the mail truck.

Mr. Cummings entered the employ of the company when it was known as the Turner & Clark Company. It became the Turner & Seymour Company in 1874, following its consolidation with the Seymour Manufacturing Company. There have been many changes in the management of the company from time to time but Mr. Cummings continued with the organization without interruption. A few years ago when the American Brass Company acquired control of the Turner & Seymour Company, Mr. Cummings was offered a pension with retirement, but he was still hale and hearty and refused the pension, saying that he was still able to work. Recently a group of prominent Connecticut men acquired full interest in the company and this change has been followed by a number of changes, among which was the retirement of several of the older employes, including Mr. Cummings.—J. H. T.

FIFTY-THREE YEARS OF SERVICE

Samuel D. Sleeth, general foundry superintendent of the Westinghouse Air Brake Company, at Wilmerding, Pa., has been promoted to the position of consulting foundry engineer. In entering upon his new duties he ends 53 years of continuous service as a "shop man" in the Air Brake foundries, having started with the organization in 1870. He has been in charge of the Company's foundry operations, covering metals as well as iron, for more than 30 years.

SAMUEL D. SLEETH

Mr. Sleeth, who has a wide acquaintance in foundry circles, began with the Air Brake company as a moulder under his father, who was the foundry foreman. He was then a youth of 18, but already had a fair knowledge of the trade as he had begun work five years before, at the age of 13, in the foundry of Lewis, Ormsby &

Phillips, of the South Side, Pittsburgh, and had held several other foundry jobs, both brass and iron, before joining his father's force.

He worked at the bench in the Air Brake foundry until 1887, when he was made assistant to his father. When the plant was moved from Pittsburgh to a larger site at Wilmerding, Mr. Sleeth was made foreman, his father having died shortly before the removal. A few years later he was given the title of superintendent, and in 1916, when the Union Switch and Signal Company at Swissvale, Pa., was taken over by the Westinghouse Air Brake Company he was appointed general superintendent in charge of the combined factory operations, which position he held up to the time of his recent promotion.

Throughout his career Mr. Sleeth has been a close student of modern foundry methods and is known as the originator of the first practical continuous pouring system, which he installed in the Air Brake foundry at Wilmerding more than 30 years ago. He has been active for many years in the affairs of the industry and is a familiar figure at trade conventions. He has served as vice president of the American Foundrymen's Association and is a past president of the Pittsburgh Foundrymen's Association.

Mr. Sleeth's successor as superintendent of the Wilmerding foundries is **F. J. McGrail,** of Los Angeles, Cal. Mr. McGrail is a foundry executive of wide experience, having an expert knowledge of the mechanical and metallurgical sides of the profession. He has served in an advisory capacity for the National Founders' Association and has written numerous papers on foundry practices for the technical press. Before coming to Wilmerding he was with the Peerless Foundry Company of Cincinnati, and previous to that, had been superintendent of some of the largest foundries in the country. For several years he was in Hawaii as foundry superintendent for the Honolulu Iron Works Co.

Fred J. Liscomb is in charge of the Engineering and Chemical Departments of the Chicago Branch of the Hanson & Van Winkle Company.

P. E. Picotte is vice-president and sales manager of the Manufacturers' Polishing & Platers' Supply Company, Inc., which has a factory in Bridgeport, Conn.

John H. Peckham, who has been connected with the Morton Company of Worcester, Mass., for many years, is now with Henry Prentiss & Company as a grinding specialist.

William D. Martin has been appointed assistant manager of the Kenosha, Wis., works of the American Brass Company to fill the vacancy caused by the resignation of James R. Anderson.

A. E. Jones, sales engineer in the New York office of the Terry Steam Turbine Company, has accepted a position with W. B. Connor, Inc., 90 West street, New York City, in a similar capacity.

J. Verner Critchley has been elected managing director and treasurer of the Coppus Engineering Corporation. Mr. Critchley is general manager of the Walden-Worcester, Inc., wrench manufacturers, and at present will give a part of his time to the new Coppus corporation. Frans H. C. Coppus, founder of the Coppus concern, is president of the new corporation. Otto Wechsberg, chief engineer, has been elected vice-president.

W. M. Corse, of the National Research Council, delivered an address with motion picture illustrations to the Chemical Society of Washington, entitled "The Mining and Smelting of Nickel Ores," on November 9.

Paul R. Croll has been engaged by the Patton-Pitcairn division of the Pittsburgh Plate Glass Company, Milwaukee, Wis., as research director. He was formerly research chemist of the New Jersey Zinc Company.

Henry M. Griffoul has accepted a position with the John Harsch Brass & Bronze Company, Cleveland, Ohio, having resigned as brass foundry foreman of the Ideal Foundry & Machine Company, Beaver Falls, Pa.

Colton D. Noble will resume his duties shortly with the North & Judd Manufacturing Company, New Britain, Conn., of which he was formerly sales manager. He left the company in 1918 to go with the M. S. Brooks Company, Chester, Conn.

Charles H. Proctor, plating chemical editor of THE METAL INDUSTRY, was scheduled to give a talk before the St. Louis Branch of the American Electro Platers Society on January 13, 1923. He was unable to be present, but sent an address which was read to the Branch. The address was on "Faith."

Frank Anderson, vice-president of the National Association of Purchasing Agents, has resigned as purchasing agent for the Llewellyn Iron Works, Los Angeles, to become president of the Atlas Brass Foundry, Inc., Los Angeles. H. W. Christenson, assistant purchasing agent for the Llewellyn company, has been appointed to succeed Mr. Anderson.

Ernest G. Jarvis, superintendent of foundries and rolling mills for the McNab & Harlin Manufacturing Company, at Paterson, N. J., has resigned, effective January 1, 1923. Mr. Jarvis expects to take a much needed rest for a few months and about January 15, will sail for a cruise of South and Central America. After his return he will resume his metallurgical activities in a consulting way.

Charles H. Buchanan, who has been associated with Mr. C. Upham Ely as his representative in selling nickel anodes and electro-platers' supplies, has been in poor health for some time and confined to his home at Hinsdale, Mass. He is still representing Mr. C. Upham Ely of the Ely Anode & Supply Company, 2 Rector street, New York, and would be pleased to hear from his old customers and friends when they are in the market for electro-plating supplies.

N. E. Zadowski on January 21 was placed in charge of the plating department of the Langenau Manufacturing Company of Cleveland, Ohio. Mr. Zadowski leaves the Bluestone Incandescent Light Company of Pittsburgh, Pa., after a long period of faithful and successful service. The Pittsburgh branch of the American Electro-Platers' Society will feel the loss of Mr. Zadowski for, due to his intelligent and intensive efforts, he was familiarly known in the craft around the Pittsburgh district as the "Father of the Pittsburgh Branch."

Deaths

THOMAS S. PATTERSON

Thomas S. Patterson, formerly in charge of the machine shop for the National Tube Company, died at his home in McKeesport, Pa., November 13th. He was born in Jedburgh, Scotland, 77 years ago and came to this country in 1870, settling in Boston. He had charge of the machine shop for 37 years. His nephew, P. C. Patterson, is chief engineer of the National Tube Company.

FREDERICK G. NIEDRINGHAUS

Frederick G. Niedringhaus, former president of the National Enameling & Stamping Company, St. Louis, Mo., died at his home in St. Louis, on November 25th from heart disease after an illness of ten days. He was 86 years old. Mr. Niedringhaus was born in Westphalia, Germany, in 1837 and went to St. Louis when 18 years old. He and his brother went into the tinware business in 1856, and which was later incorporated as the St. Louis Stamping Company and in 1899 as the National Enameling & Stamping Company, of which he retired as president in 1908. Mr. Niedringhaus served one term in Congress. He is survived by his wife, a son, Thomas K. Niedringhaus, vice-president of the National Enameling and Stamping Company, and five daughters.

HEDLEY P. CARTER

Hedley P. Carter died at his home in Ansonia, Conn., November 19th. He was vice-president, treasurer and sales manager of the H. C. Cook Company, manufacturers of sheet metal novelties and tools, Ansonia, Conn. Mr. Carter came to the Cook Company, five years ago, from the Stanley Works, New Britain, Conn., with which concern he was associated for 16 years. He was 51 years of age.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

JANUARY 8, 1923.

The year 1923 in the brass and allied industries in Waterbury has marked the slow but steady revival from the industrial depression of nearly two years following the war. Conditions are now nearest normal that they have been at any time since 1914. It is not expected that the prosperity of the hectic war period will ever again be reached but many feel that this prosperity was false, not on the sound basis which had previously marked the city's industrial conditions, and was to blame for the depression which followed.

The depression over, and the industries back on the same solid foundation of pre-war days, there is no reason to doubt that 1924 will continue to show the slow but steady growth of the industries and the city. There is practically no unemployment now, although at the first of the year it was necessary for the city to take emergency measures to find employment for the thousands of idle hands by starting a special program of public works. Now practically everyone who wishes a job can have it, and the factories are even advertising for help.

The year has also seen a slight increase in wages paid, the three largest factories, the **Chase Companies, Scovill Manufacturing Company** and the **American Brass Company** making a five-cent per hour increase, and most of the other factories falling in line. It has also seen the acquisition of the American Brass Company's stock by the **Anaconda Copper Mining Company,** and the attempt to consolidate the Chase Companies and Scovill's with the Calumet & Hecla Mining Company. The former amalgamation did not justify the fears of some that it would result disastrously for the city's industrial life to have its principal brass concern controlled by outsiders. If anything, the tendency has been to extend and build up the local plants.

Employment figures in the seven largest brass plants give a total of nearly 13,000 hands steadily employed now compared to less than 10,000 at the first of the year, showing a gain in employment of about 3,150 during the year.

Confirmation was given last month to the reports that an attempt to merge the Scovill Manufacturing Company and the Chase Companies with the Calumet & Hecla Mining Company had been made. According to officials of the two local brass companies, however, the proposal has been rejected. The Calumet & Hecla Mining Company is the second largest copper producer in the world, next to the Anaconda Company.

Officials of both local companies admit that overtures were made to them by the copper company looking to a consolidation but declare it was rejected. Just how and in what form the merger project was laid before the companies is not known, but it is known that the scheme was more than a mere offer and denial and that certain plans were laid out. The Chase interests are understood to have turned the offer down flat, but longer negotiations are said to have been held with the Scovill people, the latter also finally refusing to consider the offer. It is claimed, however, that the offer is still held open by the copper people.

It is stated authoritatively that any merger of either of the two local concerns mentioned with a mining company would not be entered into unless the copper company could be in a position to produce cheap copper. It is known that Calumet & Hecla production costs are high and that is one of the reasons for the refusal of the offer, as it was felt that it would result in increasing the local companies' own production costs. It is pointed out that should the Calumet & Hecla company effect a consolidation with some copper organization which could supply cheap copper so as to equalize the cost, a merger might be considered.

The Anaconda company, owners of the American Brass, recently acquired the stock of the Chile Copper Company, the reason being, it is said, to give Anaconda access to cheap copper which would enable it to supply its chief consumer with cheap copper when the brass market is low and hold back its western copper until the market would be able to pay a price which would give a profit on production.

Rumors of the proposed merger followed the declaration of a stock dividend of 200 per cent on Scovill stock. The stock jumped from around 300 to 390 before the new shares were issued. When the new stock was issued, three shares for one of the old, the price of the new stock dropped to around 130, later dropping to nearly 115. It then commenced to climb and in less than a month was selling for over 160, equalling 480 on the old stock. The dividends paid on the old stock were at the rate of 18 per cent. On the new stock, the latest dividend declared has been seven per cent, equalling 21 per cent on the old.

J. Parke Channing, vice-president of the **Miami Copper Company,** addressed the members of the Production Club of this city recently on "unionism." He declared that of the 40,000,000 workers in the country but 4,000,000 were union men and that this small percentage are trying to get far more out of production than they deserve and at present this unionized portion is getting more out of it than entitled to, trying to get a $80,000,000 wage scale out of a $60,000,000 production. Railroad workers, mine workers and building tradesmen were particularly blamed for getting more out of production than their share. **F. S. Chase,** president of the **Chase Companies,** spoke on the co-operation of manufacturers and employees.

The new Waterbury credit bureau has opened offices in the Chamber of Commerce building and will be able to give ratings of business houses all over the country.—W. R. B.

BRIDGEPORT, CONN.

JANUARY 8, 1923.

For Bridgeport, the year 1923 has witnessed a struggle to get back to the old pre-war basis. Many of the mushroom war baby plants which came into being during the war had to give up the ghost in the struggle for survival and a few of the old-established concerns changed hands, went through bankruptcy proceedings, or narrowly escaped going to the wall.

This period is now passed, however. For the past eight months business has been steadily on the mend and the outlook for 1923 is of continued prosperity. The plants which did not lose their heads over the war prosperity and expanded only along conservative lines were able to weather the depression that followed and are now practically all back on a pre-war basis so far as employment, general output of fabricated articles, and financial returns are concerned.

The number of hands employed in the local factories is now at the highest point it has been since the middle of 1920. Figures for 31 local factories show that their total force amounts to slightly over 18,000, an increase of over 1,000 in the past two months and an increase of over 4,000 during the year. This is equal to nearly 70 per cent of the high normal during the war and is the largest number since 1920. Indications point to absorption of nearly 15,000 more workers during the next year, as within recent months hundreds of former Bridgeport families have returned to the city.

The year has seen the passing through bankruptcy of the **Locomobile Company** and its acquisition by **W. C. Durant,** the well-known automobile builder. It has also seen the closing of the **Lake Submarine** plant.

Bridgeport was one of the few cities where home building anywhere kept pace with industrial expansion during the war. In consequence there is now an over-abundance of vacant homes, and rents are thought to be lower than in almost any other surrounding city.

BRIDGEPORT BRASS SUIT

A careful audit of the **Bridgeport Brass Company's** books was ordered by Attorney General Daugherty following a conference in Washington on January 4th between Henry L. Stimson, counsel for the Bridgeport Brass Company and

Col. Henry W. Anderson, special assistant to the attorney general, in an effort to effect a settlement of the government's claim of $700,000 alleged to have been overpaid to the company on war supply contracts.

At the outset of the conference between the Bridgeport Brass Company's attorney and the special assistant it developed that the Bridgeport concern seriously questions the figures presented by the War Department on which the conclusion was based that the company was overpaid about $700,000. The company alleges, in fact, that it was not overpaid and did not, as charged, defraud the government out of anything on the war contracts.

Mr. Stimson, on behalf of the company, offered the Department of Justice an opportunity to examine its accounts to demonstrate as it claims that no overpayment was made, at least, of anything like the large sum alleged. The Department of Justice will stand by the War Department's figures unless the accounts of the Bridgeport Brass Company show them to be grossly in error, it is said, and will insist upon the repayment of every cent turned over to the company over and above the amount due.

The accountants of the Department of Justice are expected to arrive in Bridgeport shortly and make a thorough audit of the books of the company covering the time of the performance of the war contracts and report back promptly to Col. Anderson. The audit should be completed in two or three weeks, when the conference between the attorneys will be resumed.

The Remington Arms Company, in a recent statement issued to its employees, invites them to become stockholders in the company. The company will sell to employees cumulative preferred 7 per cent stock at $85 a share which will yield 8.25 per cent. The same offer is said to have been made other plants of the concern in other cities.

The Remington Arms U. M. C. plant will not work any overtime this winter, according to Vice-President **Jarvis Williams.** "We may even have some part time but we hope to avert this with business conditions continuing favorable," he said. The company now employs 3,600 men in its ammunition, gun and cutlery divisions here. The cutlery division with 900 men has been developed since the war and last year manufactured more cutlery than the rest of the pocket knife industry in the United States. The demand for ammunition was very active up to a short time ago but is now falling off and production has been reduced. The cash register, which was developed during the war, is being manufactured at the rate of 100 a day in 38 models. Demand far exceeds the output.

Plans for the erection of a new five-story reinforced cement factory building at a cost of $250,000, which when completed next summer will house 500 additional employees, are now being drawn up for the **Jenkins Brothers Brass and Iron Valve Company.** The concern finds itself unable to handle its full output in the plant on South Main street which it purchased from the Crane Company a few years ago, according to Vice-President G. V. Barrington. The new building will be located on Water street on the site now occupied by the **Belnap Manufacturing Company.** The latter company will remove in a few weeks to a new plant in the former **Morris Metal Products** plant on Union avenue which it bought at the recent trustee's public sale. The new building will have about 75,000 square feet of floor space. The old plant is about double the size.

Headquarters of the **Hoyt Silver Company,** of Milford and New York, will be transferred to the latter city because of the poor train service from Milford to New York, according to William T. Hoyt of this city, president of the company.

An appropriation of $97,000 for improving the harbor of Bridgeport during the year beginning July 1, 1923, has been asked of Congress by the board of engineers for rivers and harbors. This is the largest appropriation asked for any Connecticut waterways.—W. R. B.

TORRINGTON, CONN.

JANUARY 8, 1923.

Torrington plants are working full time—some are on overtime schedules—and the outlook for 1923 is remarkably bright. Several of the concerns have increased their capital stock and the coming year promises to be one of expansion and general prosperity.

An addition to the plating room of the **Union Hardware** plant is being built by the Torrington Building Company. The building will be of brick, one-story high and will cost in the neighborhood of $10,000.

The Progressive Manufacturing Company has filed a certificate of increase in capital stock from $100,000 to $400,000.

E. Kent Hubbard, of Middletown, has been re-elected president of the **Connecticut Manufacturers' Association;** John H. Goss of Waterbury, vice-president, and Robert C. Buell of Hartford, secretary and treasurer.

The various groups of stockholders of the **Community Co-operative Company** have elected directors as follows: American Brass, A. C. Raspiller; Excelsior Needle, H. J. Healey; Standard, Patrick Humphries; Hendey Machine, Hugh Cameron; Turner & Seymour, John W. Whalen; general, D. P. Reidy.

The Schroeder Brothers Manufacturing Company during the past month announced the issue of $20,000 in preferred stock at 7 per cent, redeemable in five years. The purpose of this issue, the company announced, was to permit expansion, the present plant being inadequate to care for the big increase in business. The company is engaged in the manufacture of novelties and various metal products.

C. G. Hoerle, secretary and general manager of the Union Hardware Company, has been appointed an aide-de-camp with rank of major on the staff of Charles A. Templeton, who in January is to be inaugurated Governor of Connecticut. Mr. Hoerle is widely known in metal industry circles, particularly in New England. He is a native of Greenwich, 62 years old and was educated in the public schools of Port Chester and New York City. He learned the business of manufacturing cabinet and piano hardware and qualified as a machinist and toolmaker. For a time he was in charge of the Peterson factory in Port Chester and later of the factory of Hammacher, Schlemmers Company of New York. Subsequently he took charge of the lamp and burner department of the Holmes, Booth & Hayden plant in Waterbury, which was taken over by the American Brass Company. He came to Torrington 31 years ago as general manager and buyer of the Union Hardware Company.

Frederick L. Braman, vice-president of the American Brass Company, has been re-elected president of the Charlotte Hungerford hospital. Other officers are: Vice-president, Robert C. Swayze of the Torrington Manufacturing Company; treasurer, John M. Wadhams; and secretary, Willard A. Roraback. The board of governors consists of Messrs. Braman, Swayze, and Wadhams, Charles H. Alvord, Dr. Sanford H. Wadhams, Thomas W. Bryant, Dr. B. Austin Cheney, William R. Reid and Frank J. Damon. The corporators held their annual meeting on December 4. Reports were read. These showed that 773 patients were admitted to the hospital during the year. Expenditures totaled $45,374.75. Donations during the year included $8,500 from U. T. Hungerford; $7,000 from the state; $50 from the Torrington Printing Company; $514 from the Torrington Company; $377 from the Union Hardware Company; $236 from the Hendey Machine Company; $50 from the Warrenton Woolen Company, and $1,200 from the American Brass Company.

The corporators sent a telegram to Mr. Hungerford expressing their appreciation of his continued interest in the institution and assuring him of their co-operation.

Major Clifford F. Hollister, of Waterbury, Conn., was recently appointed aide-de-camp, to the Governor of Connecticut. He was born in New Haven April 15, 1880; lived in that city until he was 22 years old, receiving his education at the schools there. After leaving New Haven he lived for a time in Torrington, eventually moving to Waterbury. He is at present treasurer of the American Brass Company, with which he has been connected for twenty years.—J. H. T.

NEW BRITAIN, CONN.

JANUARY 8, 1923.

Probably one of the best indications of the business condition of a manufacturing concern is the action taken at directors' meetings. Reflecting steady business at the **Landers, Frary & Clark Company,** the directors have declared a regular dividend of 3 per cent and an extra of 3 per cent. **The Hart & Cooley Company** has recommended a 50 per cent stock

dividend and the capital stock increased from $660,000 to $990,000, with the regular dividend of 3 per cent. **The Stanley Works** have declared their regular dividend and the **American Hardware Corporation** directors have recommended a reduction in the par value of its shares from $100 to $25, and a stock dividend of 25 per cent. **The Beaton and Cadwell Company** has also increased its capitalization. Among the new concerns, the **Goss and De Leeuw Machine Company** has been incorporated, with a capitalization of $100,000. The site or time of beginning operations have not been decided. **Stanley Goss,** formerly with the **New Britain Machine Company, J. T. Black,** works manager at the **Corbin Screw Corporation,** and **A. L. De Leeuw** of Plainfield, N. J., are the incorporators.

A review of the past year shows that every local concern has emerged from the post-war slump and is at present riding on a high tide of returned prosperity. Even the near-defunct **New Britain Machine Company** seems to be slowly coming back. It has an encouraging business and some departments are working nights. Every indication at each local concern is for a bigger output next year, with no slowing down of business.

In New Britain all plants are operating full time, some overtime with night shifts. Labor supply and demand are about equal. During the month of November, records show, there is an appreciable gain over October in increased employment.

Because of the scarcity of labor in this city, more than 200 students enrolled in night school classes have dropped their studies, at least temporarily, to take advantage of overtime employment.—H. R. J.

ROCHESTER, N. Y.

JANUARY 8, 1923.

The year that is about to close has been a fairly profitable and industrious one, so far as the metal-using institutions of Rochester are concerned. Business in January and February was fair, and greater activity was noted early in the spring. The summer months were not so productive as was anticipated, owing to the coal strike, the railroad shopmen's trouble, and a general let-down in operations. Better conditions developed in the fall and continued until the Thanksgiving season. After that occasion the usual slackening season that occurs at this time of year asserted itself. However, more machinists, moulders, and mechanics are at work to-day than a year ago.

Conversations with superintendents and purchasing agents of leading manufacturing plants of Rochester reveal a feeling of genuine optimism for the year 1923. Averaging conditions for the past year these men, who are in direct touch with business as it actually exists, have expressed satisfaction at the results attained during the year of 1922. They feel that the coming year will witness a marked increase in production in every metal-using plant in Rochester. With an increased output the demand for materials will be greater, with the net result that a still larger complement of workmen will of necessity prevail.

A canvass of the plants about the city revealed the fact that in most instances a three-quarters force is employed, and but in one or two instances is a short day occasionally observed. A few employees have been laid off temporarily, but this happens every December, it is claimed. The men will be back at work early in January. There is promise of a largely increased production at the various plants.

Owing to the usually heavy building operations in Rochester this Winter the demand for copper, brass and aluminum accessories is much greater than that of a year ago. The plating shops are more active in consequence and there is an improvement in business in the brass foundries.—G. B. E.

DETROIT, MICH.

JANUARY 8, 1923.

The year just drawing to a close has proven one of the most surprising in the history of the metal industry here. The outlook in January was most decidedly discouraging. For a month previous plants were closed and there was but little indication that there would be any business at all when the new year rolled in. This condition continued for several weeks but with the advent of the Spring months slight change for the better was noted. The building business that had been stagnant for two or three years began to revive. This, of course, made a demand for plumbers' supplies. About the same time the automobile industry began to pick up. The manufacturers cut prices and buying started almost immediately. Practically all these plants then began to produce on a scale that was thought impossible a few months before. This, of course, started the accessory plants and with all this activity other lines were stimulated. The demand for brass, copper and gray iron soon was greater than it had been for many months.

Not once during the entire year has there been a slump. December is closing with the brightest prospects in the history of industrial Detroit. Every one is looking toward 1923 as one of the most prosperous years in the city's history. Building will be done on a more extensive scale than ever before, which of course means an increased demand for plumbers' supplies and other brass material used in this construction work.

Unless something happens, that has no indication now, Detroit and Michigan will experience one of the most prosperous years in their history.

December is closing with no labor difficulty. Work is plentiful and great numbers of people are coming into the city every day. The new city directory just issued places Detroit's population now at 1,181,425.—F. J. H.

CLEVELAND, OHIO

JANUARY 8, 1923.

The year 1922 has not been entitled to rank with the best years in the metal industry of Cleveland. Indeed some of the men engaged in those lines believe that it has hardly been average. On the other hand a marked improvement has been observable the last 60 days which, it is generally believed will extend throughout 1923 and a good year is looked forward to for the next 12 months. The activity of the last month or two has been clearly and unmistakably discernable notwithstanding that it has been at the approach of holiday abatement and impending inventories. It is already apparent that the activity in building, automobile and power and light, clearly foreshadowed for the ensuing year by demands already made will call for a great use of metals. This city is heavily engaged in the manufacture of products requiring metals and at almost no time is there a condition here that could be called a slump.

The Gluntz Brass Foundry Company, a new $30,000 corporation, is locating at Elm street and Washington avenue, with Mr. Gluntz in charge.

The Geneva Metal Wheel Company, at Geneva, O., proposes to ask its stockholders to increase the capital stock of the company from $80,000 to $350,000 to meet the demands of expanding business. **Glenn C. Webster,** formerly general manager of the **Tungstoller Company** here, is president of the Geneva concern and **Deane Waite,** also formerly a Tungstoller official, is superintendent of the company.

The Ohio Brass Company's Canadian plant at Niagara Falls, Ont., has been completed and entirely paid for. It was put in operation January 1, 1923.—R K. B.

TRENTON, N. J.

JANUARY 8, 1923.

The year just closed has been a prosperous one for the metal manufacturers and the season was all that could be desired. Manufacturers agreed when asked by a representative of THE METAL INDUSTRY that they believed the coming year would find all the shops busy. The days of serious labor troubles appear to be over and only minor disputes are looked for. The general pottery strike in Trenton somewhat affected the metal trade. Trenton, the second pottery city in the country, is a large market for brass fittings. The strike cut down this product for more than two months, but the strike situation is clearing up and the pottery orders for brass will soon be coming in strong again. Copper and all the white metals have advanced in price lately and it is believed they will remain up during the Winter.

The **John A. Roebling's Sons Company** has announced that it will not join the merger proposed by other similar concerns. **Colonel Washington A. Roebling,** head of the company, says the stockholders are opposed to any merger. The company recently increased its capital stock from $15,000,000 to $34,500,000, the object being to capitalize the surplus. Colonel Roebling says the concern is very busy and expects a good year during 1923. The Roebling company has completed an addition to the plant at Roebling, N. J., at a cost of $700,000. All the plants of the company are being electrified. Doing away with steam and using electric power will mean vast savings to the company. The Roeblings had one of the largest engines in New Jersey and this has been scrapped and worked up into marketable materials.

The discovery of molding sand along the Pennsylvania canal, at Washington's Crossing, extends this industry beyond Trenton to Easton, Pa., and Phillipsburg, N. J.

The **Globe Metal Novelty Manufacturing Corporation,** of Newark, has been incorporated at Trenton with $10,000 preferred and 400 shares no par value. The new concern, of which Samuel Kahan, of New York City, is an official, will make metal novelties.

Richman Electric Company, of Newark, has been incorporated with $125,000 capital by Jacob Lutbetkin.

Graphic Arts Engraving, of Camden, has been incorporated at Trenton with $25,000 capital.

Ground will be broken at Elizabeth, N. J., about March 1, by the **American Type Founders Company** for the erection of a large plant for the manufacture of type. The plant will consist of an administration building, 165 feet long and two stories in height. The main factory building will be one story and will also be used as the assembling department. The plant will cost $750,000.

Essex Radio Service, Inc., incorporated eight months ago, and which has a plant in Elizabeth, is in financial trouble. Vice-Chancellor Church has named Thomas E. Fitzsimmons as temporary receiver. It is contended that the company ran behind $8,000 in the eight months of its existence.

An involuntary petition in bankruptcy has been filed in the United States District Court by Barney Zablotsky, against the **Central Hardware Company,** of Paterson. Judge Lynch appointed Charles E. Taylor as receiver.—C. A. L.

INDIANAPOLIS, IND.

JANUARY 8, 1923.

The past year, while not satisfactory to the metal trade here, showed an improvement over the year before. The automobile plants here have been more active and those members of the trade making different parts for the better grade cars have been influenced proportionately. The last six months of the year were much better than the first six and the trade is looking confidently to a good year in 1923.

Increasing favor toward such materials as copper and zinc, as compared with galvanized iron in reference to their use in building, is reported by **W. S. Waters,** proprietor of the **Central Sheet Metal Company** of Indianapolis. Since his removal to the location on East Michigan street from Oliver avenue last summer, where he was in business for five years, Mr. Waters says business has been the best in years.

The Metals Refining Company, of Hammond, Ind., has increased its capital stock from $200,000 to $500,000 and changed the number of its directors from three to five.

Foundry men from all parts of Indiana were in Lafayette recently to attend the session of state foundry men held under the direction of the department of practical mechanics of Purdue university for the promotion and betterment of the foundry interests of the state. W. A. Knapp, assistant director of the engineering extension service at the University, presided at the opening session. Addresses of welcome were made by David E. Ross, a member of the board of trustees, and J. D. Hoffman, head of the department of practical mechanics. W. D. Hammerstadt, of Indianapolis, made the response in behalf of the foundry men and emphasized the importance of co-operation to the industry.

Prof. Hoffman presided at the afternoon session. R. E. Wendt, instructor in foundry practice at Purdue, presented a report of foundry conditions in Indiana. "The three main problems confronting foundry men today," he said, "are the labor problem, the training of young men in foundry work and the training of members of the industry to co-operate with one another to develop better foundry conditions.

F. D. Chase, of Chicago, discussed the "Layout and Design of a Modern Foundry," stating that the development of the modern plant is yet in its infancy. H. B. Northrup, of Indianapolis, discussed the business as it pertained particularly to the pig iron industry. The program lasted two days and covered a wide range of activities peculiar to the foundry business. It was the concensus of opinion that the foundrymen of Indiana should get together frequently and should cooperate in every way possible with the University.—E. B.

MONTREAL, CANADA

JANUARY 8, 1923.

Conditions in the non-ferrous metal and manufacturing business are still unchanged from last month although those engaged in some lines continue to get increased orders. In general those which were slack are still slack and those which were busy a month ago are still busy.

Building construction is still active with its constant demand on the foundries and brass shops. The business which seems to flourish at this time is the steam and hot water heating line. They are placing rush orders for brass fittings.

The new copper rolling mill for the production of rolled round and square stock, the first of the new buildings erected by the **Eugene Philips Electrical Company,** Montreal, is now in operation. It is located at Belleville, Ont., and is producing round and square stock from 1/16" to 1" diameters inclusive. Mr. Mace, general manager, reports that operations on the other buildings will be finished in the early Spring and the entire plant will be in operation in the Fall, 1923.

The Robt. Mitchell Company, the oldest brass manufacturing plant in Montreal is operating to its full capacity, supplying the fixtures and rail work in the new Mount Royal Hotel and additions to the Windsor Hotel. This concern supplied the electric fixtures, brass rails and plate work.

The Mount Royal Metal Company has moved to its new plant, corner of Mill and Oak streets. It has been in existence for 35 years as manufacturer of solders, babbits, type metals and other white metal alloys. The new plant will enable it to increase its present output considerably. In connection with this business a separate organization, **The National Bronze Company,** has been incorporated and will occupy part of the new building. It is their intention to install two furnaces made by the **Surface Combustion Company** of Philadelphia. Output will consist of brass and aluminum castings up to 800 pounds.—P. W. B.

BIRMINGHAM, ENGLAND

DECEMBER 19, 1922.

The year closes with a decided brightening of the prospect for the British metal industries. Progress is still expected to be slow, but it is believed that in the coming year it will not be subject to such frequent halts as have been experienced during the last few months. The tube and rolling mills have been quite busy since the beginning of the month. Demands from shipbuilding centres have not shown any marked growth. Whilst there is a growing disposition to place orders for new ships, the heavy costs, due in a large measure to the high wage rates still prevailing, act as check upon enterprise. The laying of the keels of two new British battleships, one in the yard of Cammell, Laird and Co. on the Mersey and the other in that of Armstrong Whitworth & Co., on the Tyne, brings the Admiralty into the market for condenser tubes, metal work for engine and other parts, cabin fittings, lamps and a large variety of other non-ferrous metal work, a substantial portion of which will be supplied from the Midlands. Electro-platers have been fairly busy, chiefly with spoons and forks and necessary tableware, though business is now beginning to fall off. A few good hotel orders have been received. Some Admiralty contracts have recently been placed and the reconditioning of two or three large passenger liners has also brought business to the local electro-platers. Stainless nickel is gaining ground chiefly in replacement of the nickel spoons and forks which for many years have been sold under names embodying the word "silver" though the demand for these is still well maintained.—G.

Business Items Verified

Rome Brass & Copper Company, Rome, N. Y., increased its capital from $5,000,000 to $10,000,000.

The Federal Aluminum Company, of Franklin, Pa., has been projected and is in process of organization and financing.

Yale & Towne Manufacturing Company, 9 East 40th street, New York, has increased its capital stock from $5,000,000 to $10,000,000.

The Connecticut Brass and Manufacturing Corporation, Waterbury, Conn., report that the rumor, as regards plans for a casting shop to be built on Watertown road is false.

The Bridgeport Brass Company, Bridgeport, Conn., announces the opening of a Detroit office in the General Motors Building, with Frank H. Longyear as district manager.

A petition was filed by the **Laib Company,** manufacturers and distributors of plumbing, heating, mill and mine supplies to increase its capitalization from $150,000 to $900,000.

The Grimm Metal Sign Corporation, 700 South 18th street, St. Louis, Mo., recently organized, has leased a building and will install equipment for the manufacture of metal signs, etc.

The Boston sales office, F. C. Cosby, manager, of the **Standard Underground Cable Company,** Pittsburgh, Pa., on January 1st, moved its headquarters from the Delta Building to 185 Devonshire street, Boston, Mass.

The Portsmouth Stove & Range Company, Portsmouth, Ohio, has completed and is operating a new addition to its foundry. This firm operates the following departments: casting shop, plating, japanning, stamping and polishing.

The Sully Brass Foundry, Ltd., 2388 Dundas street, Toronto, Ont., Canada, is installing equipment for the production of brass, bronze and aluminum castings. This firm operates a brass, bronze and aluminum foundry.

The New England Smelting Works, Inc., opened its new plant at West Springfield, Mass., November 13th, built to suit the needs of its business in producing type metal, babbitt and brazing spelter. This concern operates smelting and refining departments.

The Metal and Thermit Corporation, 120 Broadway, New York, manufacturer of metals, alloys, etc., is taking bids for the erection of a new 2-story plant, 40x100 ft., on Fayette street, Pittsburgh, Pa. H. D. Kelly, 801 Hillsboro avenue, is local representative.

I. D. Adams is a manufacturers' agent for a complete line of foundry equipment and supplies. He confines himself to New York State. Recently he opened a branch sales office in Buffalo, N. Y., at 514 Brisane Building, in charge of A. S. Kenyon as district manager.

H. Mueller Manufacturing Company, Ltd., Sarnia, Ont., Canada, is increasing its line of goods and adding considerable to its output. The machinery left over from war contracts is entirely sufficient to take care of the expansion for a number of years to come.

The New England Brass and Foundry Company was purchased by the **Coppus Engineering & Equipment Company** of Worcester, Mass. **The New England Brass Company** of Taunton, Mass., has absolutely no connection with either concern and is still doing business as usual.

The Michigan Copper and Brass Company, Detroit, Mich., has increased its capital stock from $1,000,000 to $3,000,000, by a stock dividend. Officers are: D. M. Ireland, president; H. H. Smith and S. T. Whitehead, vice-president; A. B. Seelig, secretary, and W. M. Rule, treasurer, all of Detroit.

Following a reduction from $39 to $28 in the price of the Black & Decker quarter-inch portable electric drill on November 10th, the **Black & Decker Manufacturing Company,** Towson Heights, Baltimore, Md., now announce further heavy cuts on certain popular items which are now being manufactured in such quantities as to make these reductions possible.

Damage of between $3,000 and $5,000 was done by fire in the melting room of the **Specialty Brass Company,** 805 Howland avenue, Kenosha, Wis., recently. Repairs have been made and the foundry again is in operation. It operates the following departments: brass, bronze and aluminum foundry, brass machine shop, tool room, plating and polishing.

Philip Sievering, 199 Lafayette street, New York City, has been incorporated under the name Philip Sievering, Inc. Personnel of the organization is the same as heretofore, headed by Mr. Sievering, Sr. They are incorporated for $75,000. During the past year they have increased their facilities over 100%, thus enabling them to handle quantity work in a minimum of time.

The Cincinnati Galvanizing Company, McMicken street, Cincinnati, Ohio, has authorized plans for the erection of a new 2-story plant at Chickering and Spring Grove avenues, estimated to cost about $150,000, including equipment. C. J. Hiefer, 810 Fourth National Bank Building, is engineer. This concern operates the following departments: Tool room, grinding room, galvanizing, japanning, stamping, tinning, soldering.

Homer A. Woods, 19-29 South street, Indianapolis, Ind., manufacturer of metal and electric specialties for automobile service, will erect a new four-story plant, 60 x 200 ft., estimated to cost $200,000. The machinery installation will cost in excess of $60,000. This concern operates the following departments: tool room, grinding room, cutting-up shop, plating, japanning, stamping, tinning, soldering, polishing and lacquering.

The Maumee Metal Parts Company, Toledo, Ohio, has purchased a building of Huebner-Toledo Brewing Company, at Hamilton street, and the N. Y. Central Railroad, and is remodeling it for factory purposes. The company manufactures aluminum castings in metal molds—not under pressure—by a special process and with high grade metals only. This concern operates the following departments: aluminum shop, tool room, grinding room, casting shop.

The Portland Foundry Company, Portland, Conn., has purchased the John T. Young Company of Norwich, Conn., manufacturers of the well-known line of heaters selling under the brands of Red Jacket, New Queen, Vulcan, Young and Norwich. The Portland Company has taken over the entire business with all rights, patents, trade-marks, and good-will. This company has had a long experience in the making of heaters, furnaces and stoves of different description.

The Wayne Tank & Pump Company, Fort Wayne, Ind., celebrated its thirtieth birthday recently by moving the executive offices into a handsome new office building. The new administration building is separated from the main plant buildings and is modern in every respect. It is of fire-proof construction and of handsome tapestry brick. A new light metal tank plant has just been occupied and the painting, creating and shipping departments have also just been enlarged.

Fire swept the plant of the **Crescent Brass Company,** 8410 Lake avenue, Cleveland, Ohio, which originated in the lacquer room and the lacquering department was completely gutted. The loss amounted to $5,000. The rebuilding is now nearly completed in the damanged part of the building and modern fire-proofed equipment is being installed. This concern operates the following departments: brass machine shop, tool room, spinning, brazing, plating, stamping, tinning, soldering, polishing and lacquering.

Representatives of many of the leading manufacturing concerns of the country attended the annual Sales Banquet of the **Laib Company,** Manufacturers and Distributors of Plumbing, Heating, Mill and Mine Supplies, Louisville, Ky. P. B. Wallace, assistant treasurer of the company, acted as toastmaster, and speeches were made by George H. Laib, president; Phil F. Laib, treasurer; A. W. Foos, V. J. Lawrence, B. B. Barnett, Advertising Manager, and F. A. Rooney, vice-president of Hart and Crouse, Manufacturers, Utica, N. Y.

The management of **Jenkins Bros., Ltd.,** Montreal, tendered the staff their second Annual Dinner, held in the Windsor Hotel Blue Room on Tuesday, December 19th. Twenty-five sat down to a banquet, presided over by James Webb, Manager and G. Morgan, toastmaster. Letters of congratulations were read from Farnham Yardley, president, and Eugene Brady, secretary, from the head offices in New York of the parent company. An enjoyable evening was spent in songs and toasts. The parent company was represented by William Le Compte, sales manager, New York, who responded to the toast of the Directors and President of the concern.

The Electric Storage Battery Company, Crescentville, Pa., has ordered four 6-ft. by 22-in. Hardinge Pebble Mills of special design for special grinding work. **The Jackson Mills Emery Company,** Easton, Pa., has ordered a 2-ft. Hardinge

Ball Mill for the grinding of abrasives. **The Porcelain Enamel & Manufacturing Company,** Baltimore, Md., has ordered a 2-ft. Hardinge Ball Mill for the grinding of enamel frit. **The Humphreys Manufacturing Company,** Mansfield, Ohio, has ordered a 5-ft. Hardinge Pebble Mill for the grinding of enamel frit for the enameling of porcelain bath tubs, sinks, etc. **The U. S. Sanitary Manufacturing Company,** Monaca, Pa., has ordered a 6-ft. by 22-in. Hardinge Pebble Mill for the grinding of enamel frit for enameling bath tubs, sinks, etc.

During the past few months the **Ajax Electrothermic Corporation** has sold through its agents in London, Campbell, Gifford & Company, Ltd., three 25 K. V. A. high frequency converters and seven small high frequency induction furnaces to the following institutions:

The National Physical Laboratory (corresponding to our own Bureau of Standards in Washington).

Johnson Matthey & Company, Ltd., refiners of precious metals.

Gutta Percha Company, a firm interested in the making of submarine cable.

The following high frequency induction furnaces have recently been sold in the United States:

One 35 K. V. A. equipment to Silica Products Co., Lowville, N. Y.

One 25 K. V. A. converter and 2 furnaces to the DeBats Metals Co., Bloomfield, N. J.

One 25 K. V. A. converter and 2 small furnaces to the Bureau of Mines Station at Columbus, Ohio.

One 18 K. V. A. converter and one furnace to the Mellon Institute of Industrial Research, Pittsburgh, Pa.

Two 75 K. V. A., converters and 3 100-lb. steel melting furnaces to the Western Electric Co., Chicago, Ill.

One 15 K. V. A. converter and 1 small laboratory furnace to the Lynn Works of the General Electric Company.

INCORPORATIONS

The Acme Electro-Plating Company, 1043 Fourth avenue, Huntington, W. Va., has been incorporated with a capital stock of $5,000. Incorporators are: A. Gross, Louis and B. Klamer, M. Rosen and I. B. Romer, all of Huntington. This firm operates the following departments: plating, polishing and lacquering.

The Brantford Brass Foundry, Ltd., Brantford, Ont., Canada, recently was incorporated by D. L. Webster, Alfred Serjeant and T. E. Hutton, and capitalized at $100,000. This concern operates the following departments: brass, bronze and aluminum foundry, brass machine shop, grinding room, casting shop, polishing and lacquering.

The Garford Manufacturing Company, Newcomerstown, Ohio, was recently organized and has established a plant for the manufacture of brass valves and for doing jobbing machine shop work. This concern operates the following departments: brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, casting shop, cutting-up shop and japanning.

The Apex Tool & Stamping Company, 4830 Southern Parkway, Louisville, Ky., has been organized recently to manufacture tools and stamped metal goods. Their plant is now in operation and they are in production on a new emery wheel dresser with a patented shield to protect the operator. This concern operates the following departments: tool room, grinding room and stamping.

The All-American Metallic Casket Corporation, Cicero, Outagamie County, Wis., has been organized with a capital stock of $50,000 and is starting work on the construction of a plant at Nichols, near Appleton, Wis.. The incorporators are: J. A. Burrichter and Edward A. Walters, St. Paul, Minn., and F. H. Tandy, Nichols. This concern operates the following departments: plating, japanning, stamping, soldering, polishing and lacquering.

The Branford Brass Foundry Company, Inc., Branford, Conn., recently incorporated under the laws of Connecticut, to engage in the brass foundry business, organized by the election of the following officers: President, H. A. Cox; secretary, F. A. Ells and treasurer, R. L. Rosenthal. This concern operates the following departments: brass, bronze and aluminum foundry, brass machine shop, casting shop, tinning, soldering and polishing.

Arthur H. Parker, founder and formerly president and general manager **Parker Wire Goods Company,** Worcester, Mass., has organized the Parker Metal Goods Company with a capital of $50,000 to make a general line of wire hardware, special wire goods and metal stampings. The company will begin production as soon as manufacturing space can be obtained. Mr. Parker is president and treasurer of the new company. This firm operates the following departments: japanning and stamping.

OAKLEY CHEMICAL COMPANY

The Oakley Chemical Company held their Sixth Annual Sales Conference at the General Offices, 22 Thames street, New York, N. Y., on December 18-21, 1922. The meetings were full of life and spirit, and the technical sessions valuable in the information imparted and the discussions which followed. By way of recreation a Dinner Party was held at the Hotel McAlpin and a Theater Party, December 19.

Among the papers read were the following:
Oakite in Steel Mills.
Cleaning Auto Bodies Before Painting.
Spraying Oakite Solution.
Cleaning Before Plating.
Make-up and Operation of Plating Solutions.
Special Cleaning Operations on Easily Tarnished Metals.

OAKLEY CHEMICAL COMPANY ASSEMBLED IN NEW YORK

MAGNUS CHEMICAL COMPANY

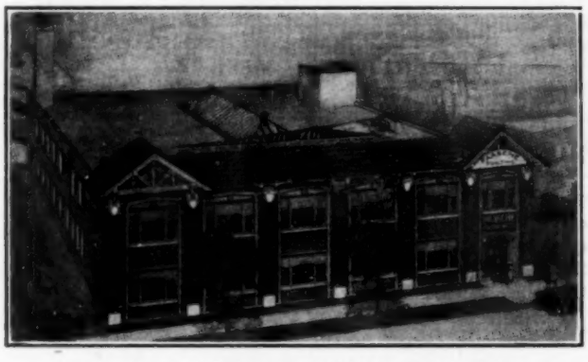
The Magnus Chemical Company, Brooklyn, N. Y., held its Annual Salesmen's Convention December 20-22, 1922. They had some very interesting sessions, including many papers on industrial cleaning; also talks by Prof. R. W. Mitchell, of the Massachusetts Institute of Technology; M. G. Kopf, Engineer of the Davis Sewing Machine Company, and Mr. MacStocker, a practical electroplater. A real effort was made to put industrial cleaning on a scientific basis.

MAGNUS CHEMICAL COMPANY FORCE ASSEMBLED

Mr. W. A. Graue read a paper which he had read recently at a meeting of the Bridgeport Branch of the American Electro Platers' Society.

AIR BRUSHES

The Paasche Air Brush Company is located in its new building at 1927 Diversey Parkway, Chicago, Ill.



PAASCHE AIR BRUSH COMPANY BUILDING

BUSINESS TROUBLES

A petition in bankruptcy was filed against the **Unionport Brass Foundry Company, Inc.,** 2534 E. 177th street, New York, by Jacob Breen for $2,500; M. Cohen, $4,000; M. Brown, $1,000.

Erie Malleable Iron Company, Erie, Pa., requested an order authorizing and directing the receiver to sell substantially all of the property and assets of the receivership estate of the **Standard Parts Company,** of Cleveland, O., with the exception of the accounts receivable, insurance, bills receivable and unliquidated claims at public auction or private sale, as a whole or in parcels as may be deemed expedient. It was ordered by the District Court of the United States for the Northern District of Ohio, Eastern Division, that a further hearing be had upon said application on the 6th day of January, 1923, at 9:30 o'clock a. m.

On the 28th day of December, 1922, the receivers of the **East Iron & Machine Company,** Lima, Ohio, filed their motion and application in the above-entitled cause, requesting an order of the Court to return the real estate and the tangible property to the corporate management of the East Iron & Machine Company and said receivers to retain all accounts, bills and notes receivable until the receivers' obligations consisting of notes, bills, accounts and receivers' certificates have been satisfied in full. The Court fixed Saturday, January 6, 1923, at 10 o'clock a. m., Eastern Time, for a hearing on said motion and application and any objections to be made thereto; and at the same time the Court will be asked to make such order as it may deem proper in order to take care of the costs and expenses. A total of less than $20,000, in all was unwilling to assign for bonds of the new issue. This is a remarkable showing out of a total of over $260,000. The $20,000 includes a host of items too small to be paid in bonds.

THE INTERNATIONAL NICKEL COMPANY

CONSOLIDATED GENERAL PROFIT AND LOSS STATEMENT
SIX MONTHS, ENDING SEPTEMBER 30, 1922

Earnings		$417,378.72
Other Income		47,714.09
Total Income		$465,092.81
Administration and General Expense	$169,656.33	
Reserved for Federal and Franchise Taxes	21,171.11	190,827.44
Net Income		$274,265.37
Preferred Dividend No. 67, Paid August 1, 1922	$133,689.00	
Preferred Dividend No. 68, Payable November 1, 1922	133,689.00	267,378.00
Balance		$6,887.37
Shut down expense and depreciation.		381,093.48
Reduction in Surplus		$374,206.11

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	$100	$420	$460
American Hardware Corporation	100	225	235
Bristol Brass	25	15	20
International Nickel, com.	25	13½	14
International Nickel, pfd.	100	68	70
International Silver, com.	100	35	40
International Silver, pfd.	100	102	104
New Jersey Zinc	100	172	175
Rome Brass & Copper	100	115	...
Scovill Manufacturing Co., new	...	150	160
Yale & Towne Manufacturing Co., new	...	58	60

Corrected by J. K. Rice, Jr., Co., 36 Wall Street, New York.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

The rapid advances in the price of ingot copper which were made effective during the end of December, naturally were reflected in corresponding advances in the prices of brass and copper fabricated materials. The year closed with the market very firm and indications were all for further advances. The mills are almost, without exception, running to capacity and report that in many departments the output for the first quarter of 1923 has been sold. There appears to be an almost universal feeling of hopefulness over the prospects for 1923 and the expectations are, that, this will be another banner year in the history of the industry.

The automobile and the building industry both appear to

have very brilliant prospects, and both of these lines consume very large quantities of copper and brass materials. It is expected that the heavy consumption of these materials in 1922 will be duplicated if not increased in 1923.

An item that will be of great interest to the non-ferrous metal trade is the development of the production of nickel sheet. Heretofore, this production has been very limited and as a consequence there has been but slight difference in the price of nickel sheets produced in this country and those imported from Germany. There are many industries in which nickel sheets and rods could be used because of the superior chemical and physical properties of nickel and its adaptability for working into various fabricated forms.

It has now been definitely established that nickel in sheets, rods and tubes can be produced in this country at a price which will permit the use of these materials on a very wide scale and in places where, it has in the past, been difficult to apply them because of the price. Orders of considerable size have already been placed for nickel sheets, and inquiries are being received from many sources.

Metal Market Review

Written for The Metal Industry by METAL MAN

COPPER

The December advance in market prices and the heavy sales for both domestic and foreign shipment were the recent outstanding features in copper. Early in the month price levels on the electrolytic basis of 13⅞c to 14c, with a fairly steady tone prevailing.

Demand set in strong about the middle of the month. About this time producers were besieged with inquiries and orders at a surprising rate, and as these increased from day to day prices began to mount rapidly. Liberal buying was noted during the first half of the month at 14c and 14⅛c, but with the appearance of an exceptionally active demand the market quickly advanced to 14⅝c @ 14¾c.

The last three months were exceptionally active at the brass and copper mills. Production of copper, however, is also increasing. Refinery output is running at nearly double the rate it was one year ago. Recent developments indicate that Chile is preparing to make larger shipments to this country. Anaconda control of the Chile Copper Co. is expected to result in more favorable copper market developments. It is difficult to understand how this can happen and Chile maintain capacity operations.

Total sales of copper in this country for 1922 are roughly estimated at around 1,700,000,000 pounds. Output from refineries during the year are placed at from 1,500,000,000 to 1,600,000,000 pounds; domestic consumption at 1,200,000,000 pounds and exports at 725,000,000 pounds. Refined stocks on January 1, 1923, are estimated at about 220,000,000 pounds.

The American market quotes 14¾ cents for electrolytic shipments extending over three to six months. Sales of Lake were made at 15 cents and casting holds firm at 14⅛c@14¼c.

ZINC

Although the production of zinc in 1922 showed a large increase over the figures for 1921 the urgency of demand has lifted prices to the New York level of 7.35c. Market tone is firm and recent sales in fair volume. Recent sales for shipment over first quarter of this year were made on East St. Louis terms of 6.90c to 7.00c, the earlier shipments commanding the higher figures. Both domestic and foreign consumers have been looking for lower prices for futures. Scarcity of spot deliveries has kept prompt shipments up. The spread of £2 per ton between prompt and futures indicates the feeling in London quarters. The recent high mark in the local market was 7.70c.

According to the advance statement of the U. S. Geological Survey, the total output of primary metallic zinc from domestic and foreign ores was about 339,000 tons, as compared with 200,500 tons in 1921. Apparent consumption of primary zinc in 1922 was about 363,000 tons, against 203,600 tons in 1921, and 323,043 tons in 1920. The stock of zinc at end of November was about 15,500 tons, as against 70,452 tons at the end of 1921. Production in 1917 amounted to 669,573 tons, and domestic consumption to estimated quantity of 413,643 tons.

TIN

Consumption has broadened out to remarkable proportions throughout the various domestic consuming industries the past year. Obviously this has greatly encouraged bullish sentiment among London and East India shippers. Domestic consumption of tin was on a large scale. The tin plate industry was a prominent factor in the demand.

American tin deliveries in 1922 reached the total of 57,460 tons, as compared with 25,918 tons in 1921. They were the largest in the last 10 years with the exception of 1917 and 1918 when deliveries were respectively 57,881 tons and 58,339 tons. The total visible supply of tin on December 31, 1922, was 24,930 tons, and compared with 25,220 tons on December 31, 1921.

Price fluctuations in the New York market in 1922 recorded a spread of 10¼ cents per pound. The low price for the year was 28¾c in March and the high 39c in December. During the last ten years the lowest price of Straits tin was 25½c in 1921 and the highest $1.10 in 1918. The London Standard market showed an average price of about £159 per ton for the past year, against £165 8s 2d for 1921 and £296 1s 7d for 1920.

The local market opened up in January firm but not very active. On January 3rd spot Straits quoted 38⅛c to 38⅝c, with February and March 38¾c. The holdings of the Federated Malay Straits are understood to be about 11,000 tons, but this tin will probably not be liquidated until prices advance considerably above the present level. January 4, London cables were off £1 2s 6d on Straits, with sales of 1,100 tons; tone here easier also.

LEAD

A strong upward trend has been the conspicuous feature of the lead market during the entire year of 1922. The stringency in spot supplies and the continuous large movement into consumption enabled producers to effect a gradual advance in price from 4.70 cents at the beginning of 1922 to 7.25 cents at the end of the year.

The total refinery production of lead in the United States in 1922, including that from foreign ore and bullion, amounted to about 531,000 tons, as compared with 448,589 tons in 1921. From a total supply of about 533,000 tons of refined lead (exclusive of stocks) there was withdrawn for export about 38,000 tons, leaving 495,000 tons available for consumption in the United States, as against 444,872 tons in 1921 and 538,020 tons in 1920. The foregoing figures are the official compilation of the U. S. Geological Survey, under date of January 2, 1923.

Domestic offerings for early shipment are small and January deliveries are well taken. A stringent situation exists in Europe also. Outlook for increased supplies at foreign markets is not very encouraging unless Mexican shipments are made to European consumers. The foreign quotations showed an upward trend lately. New York price remains at 7.25 cents, with East St. Louis at 7.05 cents. Tone is firm, and a further advance would not be surprising.

ALUMINUM

Domestic and imported aluminum prices are all higher than they were a few weeks ago. The trust quotations are made on specifications and quantities, but consumers generally have to be convinced that recent advances are justified. The open market is steady on the basis of 23.00 to 23.50 for 99 per cent virgin metal, and 22.50 to 23.00 for 98-99 per cent. Consumers are slow in paying the high prices forced upon them by the present tariff. There has been talk of curtailing use of aluminum in the automotive industry on account of increased cost of the article.

ANTIMONY

The market for antimony has been slack and without interesting features for several weeks. There is a slight show

of life apparent lately, however, and buyers have put out feelers on forward shipments. Quotations from stocks carried here are 6.25c to 6.35c delivery within 30 days. China offerings are somewhat above price asked by local holders. Stocks in Chinese hands are supposed to be small as there is no recent selling pressure from producers in the Orient.

QUICKSILVER

Demand for quicksilver improved in the latter part of December and prices advanced $2.00 to $3.00 per flask. Quotations are now $73 to $74. Orders were booked for fair-sized lots lately by importers. Present supplies are estimated at less than two months requirements. Imports of 1,000 flasks from Italy arrived a few days ago, and further importations are due this month. Some business was reported at better than above quotations.

PLATINUM

There have been recent sharp advances in platinum. Limited offerings, depleted stocks in manufacturers' hands and curtailed production in Russia furnished the conditions for higher prices. Holders are now demanding $118 an ounce for limited quantities. Around the middle of December the quotation was $108, but soon after that the price was advanced $10.00 an ounce. Urgent needs developed before Christmas and gave sellers opportunity to take immediate advantage of the stringent situation. A reaction is expected in the near future by some importers.

SILVER

There has been some recovery in the bullion price of silver from the recent low level of 62⅜ cents. That price was the lowest in 1922, and compared with a high of 74¼ cents on May 22, 1922. The Far East showed remarkable power of absorption last year by takings of a total of 138,000,000 ounces thereby making a new high record in Orient demand. Silver stocks at Shanghai have shown a decrease during the last few months. Preliminary returns indicate United States production for 1922 of 61,000,000 ounces, as against 45,600,000 ounces in 1921. World output last year estimated at 207,000,000 ounces, Mexico being the largest contributor with an output of 76,000,000 ounces. Total world production in 1921 was 168,300,000 ounces. The total purchases of silver by U. S. Government under the Pittman Act amount to date to 150,630,076 ounces, leaving 57,991,980 ounces to complete purchases. A sharp advance on January 4th sent the prices of foreign silver to 66⅜ cents, with London cables quoting 32¼ pence.

OLD METALS

Activity and firmness were notable in the market for scrap metals, particularly for copper, recently. The strong tone for new copper gave new impetus to trade among dealers in scrap material. A good demand and higher prices resulted in substantial orders. Brass shared in a sympathetic improvement for the more preferable alloys. Lead and zinc scrap is in fair demand also. There is not much doing in the nickel and silver scraps. Dealers quote the following as buying prices: Crucibled copper, 12½@13c; light copper, 10½@10¾c; heavy brass, 6¾@7c; new brass clippings, 8¾@9¼c; aluminum clippings, 15½@16½c; heavy lead, 5½@6c; old zinc scrap, 4¼@4½c, and battery lead, 3¾@3⅞c.

WATERBURY AVERAGE

Lake Copper—Average for 1920, 13.136. January, 1922, 13.875—February, 13.375—March, 13.125—April, 13.00—May, 13.375—June, 14.00—July, 14.125—August, 14.125—September, 14.25—October, 1425—November, 14.125—December, 14.50.

Brass Mill Zinc—Average for 1920, 5.175—January, 1922, 5.25—February, 5.00—March, 5.10—April, 5.40—May, 5.55—June, 5.85—July, 6.20—August, 6.50—September, 7.10—October, 7.65—November, 7.90—December, 7.90.

Daily Metal Prices for the Month of December, 1922

Record of Daily, Highest, Lowest and Average

Metal Prices for January 12, 1923

Date	1	4	5	6	7	8	11	12	13	14	15	18	19
Copper (f. o. b., Ref.) c/lb. Duty Free:													
Lake (Delivered)	14.125	14.125	14.125	14.125	14.125	14.125	14.125	14.125	14.25	14.25	14.50	14.75	14.875
Electrolytic	13.75	13.75	13.75	13.75	13.875	13.95	13.95	13.95	14.00	14.125	14.25	14.50	14.625
Casting	13.40	13.40	13.40	13.40	13.40	13.50	13.50	13.50	13.50	13.60	13.75	14.00	14.25
Zinc (f. o. b., St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	7.10	7.15	7.20	7.30	7.30	7.30	7.25	7.20	7.20	7.15	7.15	7.10	7.05
Brass Special	7.15	7.20	7.30	7.40	7.40	7.40	7.35	7.30	7.30	7.25	7.20	7.15	7.15
Tin (f. o. b., N. Y.) c/lb. Duty Free:													
Straits	36.00	36.00	36.25	37.00	37.375	37.50	37.375	37.00	37.375	37.625	37.50	38.375	38.125
Pig 99%	35.00	37.875	35.125	35.875	36.25	36.375	36.375	35.75	36.375	36.50	36.375	37.375	37.125
Lead (f. o. b., St. L.) c/lb. Duty 2½c/lb.	7.00	7.00	7.00	7.00	6.95	6.95	6.95	6.90	6.90	6.90	6.90	6.90	7.00
Aluminum, c/lb. Duty 5c/lb.	23.00	23.00	23.00	23.00	23.00	23.00	23.00	23.00	23.00	23.50	23.50	23.50	23.50
Nickel c/lb. Duty 3c/lb.													
Ingot—Internat. Nick. Co.	36	36	36	36	36	36	36	36	36	36	36	36	36
Outside Spot	32-4	32-4	32-4	32-4	32-4	32-4	32-4	32-4	32-4	32-4	32-4	32-4	32-4
Electrolytic (Internat. Nick. Co.): Ni.—99.80. contain. impur.—.14	39	39	39	39	39	39	39	39	39	39	39	39	39
Brit.-Amer. Nick. Corp.: Ni.—98.50, contain. impur.—.80	33	33	33	33	33	33	33	33	33	33	33	33	33
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	6.45	6.45	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.35	6.30	6.30	6.30
Silver (foreign) c/oz. Duty Free	64.75	64.625	65.125	65.375	64.375	64.25	64.625	64.50	64.00	63.50	62.375	62.875	62.875
Platinum $/oz. Duty Free	104	105	105	105	105	107	107	107	107	108	108	118	118

Date	20	21	22	25	26	27	28	29	High	Low	Aver.	Jan. 12
Copper (f. o. b., Ref.) c/lb. Duty Free:							Holiday					
Lake (Delivered)	14.875	14.875	14.875	.....	14.875	15.00	15.00	15.00	15.00	14.125	14.506	15.00
Electrolytic	14.625	14.625	14.625	.....	14.625	14.625	14.625	14.625	14.625	13.75	14.123	14.625
Casting	14.25	14.25	14.25	.....	14.25	14.25	14.25	14.25	14.25	13.40	13.818	14.25
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.:												
Prime Western	7.05	7.00	7.00	.....	7.00	7.00	7.00	7.00	7.30	7.00	7.125	7.00
Brass Special	7.15	7.10	7.10	.....	7.10	7.10	7.10	7.10	7.40	7.10	7.215	7.10
Tin (f. o. b. N. Y.) c/lb. Duty Free:												
Straits	37.875	38.25	38.50	.....	38.875	39.00	38.80	38.75	39.00	36.00	37.678	39.25
Pig—99%	36.75	37.25	37.50	.....	37.50	37.625	37.50	37.375	37.625	34.875	36.544	38.25
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	7.05	7.10	7.10	.....	7.10	7.10	7.10	7.10	7.10	6.90	7.00	7.60
Aluminum, c/lb. Duty 5c/lb.	23.50	23.50	23.50	.....	23.50	23.50	23.50	23.50	23.50	23.00	23.275	23.50
Nickel c/lb. Duty 3c/lb.												
Ingot—Internat. Nick. Co.	36	36	36	.....	36	36	36	36	36	36	36	36
Outside Spot	32-4	32-4	32-4	.....	32-4	32-4	32-4	32-4	32-4	32-4	32-4	32-4
Electrolytic (Internat. Nick. Co.)— Ni—99.80, contain. impurities—.14	39	39	39	.....	39	39	39	39	39	39	39	39
Brit.-Amer. Nick. Corp.— Ni—98.50, contain. impurities.—.80				.....	33	33	33	33	33	33	33	33
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	6.30	6.30	6.30	.....	6.30	6.30	6.30	6.30	6.45	6.30	6.353	6.75
Silver (foreign) c/oz. Duty Free	62.75	63.00	62.875	.....	62.75	63.50	64.625	64.25	65.375	62.375	63.85	65.375
Platinum $/oz. Duty Free	118	118	118	.....	118	118	118	118	118	104	111.50	118

Metal Prices, January 15, 1923

INGOT METALS AND ALOYS

Brass Ingot, Yellow	"	"	"	10 to12¼
Brass Ingots, Red	"	"	"	12¼to14
Bronze Ingot	"	"	"	13 to15¼
Bismuth				$2.70-2.75
Cadmium				$1.20-1.30
Casting Aluminum Alloys	"	"	"	21 to24
Chromium Metal—95-98% Cr., per lb. Cr. contained, nom.				1.50
Cobalt—97% pure				$2.75-2.85
Manganese Bronze Castings	"	"	"	21 to33
Manganese Bronze Ingots	"	"	"	12 to16½
Manganese Bronze Forgings	"	"	"	30 to40
Manganese Copper, 30%	"	"	"	28 to45
Manganese Metal—95-98% Mn., carbon free, per lb., nom.				0.75
Magnesium Metal				$1.25-1.50
Parsons Manganese Bronze Ingots	"	"	"	18½to20
Phosphor Bronze	"	"	"	24 to30
Phosphor Copper, guaranteed 15%	"	"	"	17 to23
Phosphor Copper, guaranteed 10%	"	"	"	16½to22
Phosphor Tin, guarantee 5%	"	"	"	43 to57
Phosphor Tin, no guarantee	"	"	"	41 to55
Quicksilver				$73.00-74.00
Silicon Copper, 10%	according to quantity			28 to35

OLD METALS

Buying Prices		Selling Prices
12 to12¼	Heavy Cut Copper	13¼to13¾
11¾to12	Copper Wire	13 to13½
10½to10¾	Light Copper	11½to12
9½to 9¾	Heavy Machine Comp	11 to11½
6¾to 7	Heavy Brass	8½to 9
5½to 6	Light Brass	7½to 7¾
6¾to 7	No. 1 Yellow Brass Turnings	8 to 8½
8¼to 8¾	No. 1 Comp Turnings	10 to10½
5½to 5¾	Heavy Lead	6 to 6¼
4½	Zinc Scrap	4¾to 5
8½to 9	Scrap Aluminum, Turnings	11 to12
14½to15	Scrap Aluminum, cast alloyed	15 to16
16 to16½	Scrap Aluminum, sheet (new)	18 to19
18½	No. 1 Pewter	22½
15	Old Nickel anodes	17
23 to25	Old Nickel	27 to29½

BRASS MATERIAL—MILL SHIPMENTS

In effect December 26, 1922

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.19	$0.20⅝	$0.22¼
Wire	0.19½	0.21⅛	0.22¾
Rod	0.17¼	0.21⅜	0.23
Brazed tubing	0.26	.....	0.31
Open seam tubing	0.26	.....	0.31
Angles and channels	0.29	.....	0.34

To customers who buy less than 5,000 lbs. in one order

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.20	$0.21⅝	$0.23¼
Wire	0.20½	0.22⅛	0.23¾
Rod	0.18¼	0.22⅜	0.24
Brazed tubing	0.27	.....	0.32
Open seam tubing	0.27	.....	0.32
Angles and channels	0.30	.....	0.35

SEAMLESS TUBING

Brass, 23½c. to 24½c. per lb base.
Copper, 25¼c. to 26¼c. per lb. base.

TOBIN BRONZE AND MUNTZ METAL

Tobin, Bronze Rod	21c. net base
Muntz or Yellow Metal Sheathing (14"x 48")	19c. " "
Muntz or Yellow Rectangular Sheets other than Sheathing	20c. net base
Muntz or Yellow Metal Rod	17c. " "

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	22¼c. to 23¼c.
From stock	23¼c. to 24¼c.

BARE COPPER WIRE—CARLOAD LOTS

17c. to 17¾. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order	20½c. per lb. base
100 lbs. to 200 lbs. in one order	21c. per lb. base

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 9¼c. to 9½c. basis less 8 per cent. discount.

Casks, jobbers' prices	10c. to 10¾c.
Open casks, jobbers' prices	10¾c. to 11¾c.

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga. and heavier, base price	36c.
Aluminum coils, 24 ga. and heavier, base price	33c.
Foreign	42c.

NICKEL SILVER (NICKELENE)

Base Prices

Grade "A" Nickel Silver Sheet Metal

10%	Quality	27¼c. per lb.
15%	"	29c. " "
18%	"	30c. " "

Nickel Silver Wire and Rod

10%	"	30¼c. " "
15%	"	34¼c. " "
18%	"	37c. " "

MONEL METAL

Shot	32
Blocks	32
Hot Rolled Rods (base)	40
Cold Drawn Rods (base)	50
Hot Rolled Sheets (base)	45

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25c. over. Above prices f. o. b. mill.

SILVER SHEET

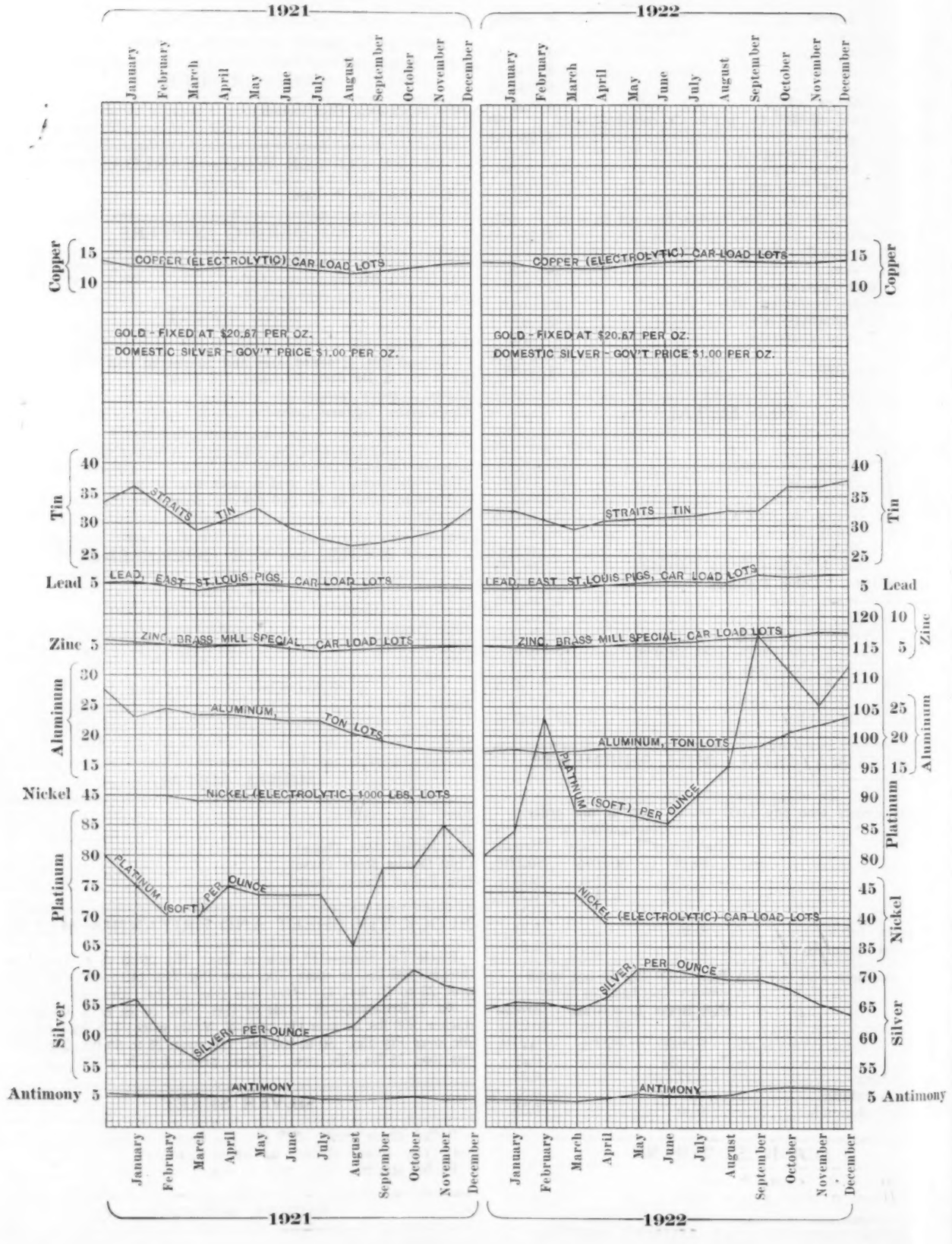
Rolled silver anodes .999 fine are quoted at from 68c. to 71c. per Troy ounce, depending upon quantity.

Rolled sterling silver 68c. to 70c.

NICKEL ANODES

85 to 87% purity	37½c. per lb.
90 to 92% purity	40c. per lb.
95 to 97% purity	42c.-42½c. per lb.

Chart of Metal Prices for 1921-1922



Pig Iron and Metal Products of the United States

Calendar Years 1913-1921. (1922 Estimated.)

(FROM THE UNITED STATES GEOLOGICAL SURVEY.).

PRODUCTS METALLIC	1913 Quantity	1913 Value	1914 Quantity	1914 Value	1915 Quantity	1915 Value	Products
Pig iron (spot value), long tons....	30,388,935	$458,342,345	22,263,263	$298,777,429	30,384,486	$401,409,604	Pig iron
Silver, commercial value, troy ounces	66,801,500	40,348,100	72,455,100	40,067,700	74,961,075	37,397,300	Silver
Gold, coining value, troy ounces....	4,299,783	88,884,400	4,572,976	94,531,800	4,887,602	101,035,700	Gold
Copper, value at New York, pounds.	1,224,484,098	189,795,035	1,150,137,192	152,968,000	1,388,009,527	242,902,000	Copper
Lead, value at New York, short tons	411,878	36,245,264	512,794	39,998,000	507,026	47,660,000	Lead
Zinc, value at St. Louis, short tons.	337,252	37,772,224	343,418	35,029,000	458,135	113,617,000	Zinc
Quicksilver, value at S. Fran., flasks	20,213	813,171	16,548	811,680	21,033	1,804,631	Quicksilver
Aluminum, pounds	*	9,450,000	*	10,080,000	*	16,280,000	Aluminum
Antimonial lead, short tons.....	16,665	1,591,854	16,667	1,572,167	23,224	3,665,736	Antim. Lead
Nickel, value at New York, sh. tons.	241	79,393	423	313,000	822	538,222	Nickel
Tin, short tons	.....	46,699	104	66,560	102	78,846	Tin
Platinum, value at New York City, troy ounces	1,034	46,530	6,324	280,885	8,665	478,688	Platinum
Total value of metallic products (approximate) (b)	.....	$878,869,000	.....	$686,639,000	.....	$991,730,000	

PRODUCTS METALLIC	1916 Quantity	1916 Value	1917 Quantity	1917 Value	1918 Quantity	1918 Value	Products
Pig iron (spot value), long tons....	39,126,324	$663,478,118	38,612,546	$1,053,785,975	38,230,440	$1,180,759,565	Pig iron
Silver, commercial value, troy ounces	74,414,802	48,953,000	71,740,362	59,078,100	67,810,139	66,485,129	Silver
Gold, coining value, troy ounces....	4,479,056	92,590,300	4,051,440	83,750,700	3,320,784	68,646,700	Gold
Copper, value at New York, pounds.	1,927,850,548	474,288,000	1,886,120,721	514,911,000	1,908,533,595	471,408,000	Copper
Lead, value at New York, short tons	552,228	76,207,000	548,450	94,333,000	539,905	76,667,000	Lead
Zinc, value at St. Louis, short tons.	564,338	151,243,000	584,597	119,258,000	492,405	89,618,000	Zinc
Quicksilver, value at S. Fran., flasks	29,932	3,768,139	36,159	3,808,266	32,883	3,863,752	Quicksilver
Aluminum, pounds	*	33,900,000	*	45,882,000	*	41,159,000	Aluminum
Antimonial lead, short tons.....	24,038	4,483,582	18,646	3,781,560	18,570	2,826,350	Antim. Lead
Nickel, value at New York, sh. tons.	918	671,192	402	331,556	441	401,000	Nickel
Tin, short tons	140	122,000	110	135,600	110	118,500	Tin
Platinum and allied metals, value at New York City, troy ounces.....	28,088	2,301,762	38,831	4,023,757	59,753	6,517,980	Platinum
Total value of metallic products (approximate) (b)	.....	$1,620,745,000	.....	$2,086,234,000	.....	$2,153,318,000	

PRODUCTS METALLIC	1919 Quantity	1919 Value	1920 Quantity	1920 Value	1921 Quantity	1921 Value	Products
Pig iron (spot value), long tons....	30,130,231	$775,915,043	35,710,227	$1,140,904,096	16,038,619	$389,437,792	Pig iron
Silver, commercial value, troy ounces	56,682,445	63,533,652	55,361,573	60,801,955	53,052,441	53,052,441	Silver
Gold, coining value, troy ounces....	2,918,628	60,333,400	2,476,166	51,186,900	2,422,006	50,067,300	Gold
Copper, value at New York, pounds.	1,286,419,329	239,274,000	1,209,061,040	222,467,000	505,586,098	65,221,000	Copper
Lead, value at New York, short tons	424,433	44,990,000	476,849	76,296,000	398,222	35,840,000	Lead
Zinc, value at St. Louis, short tons.	452,272	66,032,000	450,045	72,907,000	198,232	19,823,000	Zinc
Quicksilver, value at S. Fran., flasks	21,415	1,933,560	13,392	1,066,807	6,339	300,595	Quicksilver
Aluminum, pounds	*	38,558,000	*	41,375,000	*	10,906,000	Aluminum
Antimonial lead, short tons.....	13,874	1,513,968	12,535	1,963,255	10,064	870,059	Antim. Lead
Nickel, value at New York, sh. tons.	511	434,485	365	293,250	111	86,000	Nickel
Tin, short tons	56	73,400	22	22,000	4	2,400	Tin
Platinum and allied metals, value at New York City, troy ounces.....	45,109	5,614,335	41,544	4,697,722	56,370	4,238,989	Platinum
Total value of metallic products (approximate) (b)	.....	$1,351,600,000	.....	$1,724,300,000	.....	$656,000,000	

1922 ESTIMATED†	Value Quantity	Value Total	Value Per Unit
Pig iron, long tons.....	26,750,000	$711,817,500	$26.61(a)
Copper, pounds	1,398,000,000	187,080,360	13.382c
Gold, ounces, fine.....	2,660,914	55,000,000	$20.66 per oz.
Antimonial lead, short tons.....	6,688	(i)	(i)
Lead, short tons (foreign and domestic).....	550,000	63,074,000	$114.68(c)
Zinc, short tons.....	371,000	42,412,720	114.32(d)
Quicksilver, flasks	6,500	383,149	$58.946(c)
Silver, ounces, fine.....	58,000,000	39,162,180	67.521c(e)
Tin, pounds	(i)	(i)	32.554c(f)

(i) Figures not available.
(†) Figures from Engineering and Mining Journal.
(b) Includes some items of minor interest to metal trades not shown in table.
(*) Survey not at liberty to publish figures.

(a) Bessemer.
(c) New York.
(d) St. Louis.
(e) Foreign Market.
(f) Straits.

Supply Prices, January 15, 1923

CHEMICALS

In Commercial Quantities—New York Prices

Acetone	lb.	.21½–.25
Acid—		
Boric (Boracic) Crystals	lb.	.13
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.02½
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls.	lb.	.07
Nitric, 36 deg. Carboys	lb.	.07
Nitric, 42 deg. Carboys	lb.	.07¼
Sulphuric, 66 deg. Carboys	lb.	.02½
Alcohol—		
Butyl	lb.	.25-30
Denatured in bbls.	gal.	.36
Alum—		
Lump, Barrels	lb.	.04½
Powdered, Barrels	lb.	.05
Aluminum sulphate, commercial tech	lb.	.02½–.03
Aluminum chloride solution	lb.	.20
Ammonium—		
Sulphate, tech., Barrels	lb.	.04
Sulphocyanide	lb.	.50
Argols, white, see Cream of Tartar	lb.	.25
Arsenic, white, Kegs	lb.	.15
Asphaltum	lb.	.35
Benzol, pure	gal.	.65
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.06½
Calcium Carbonate (Precipitated Chalk)	lb.	.05
Carbon Bisulphide, Drums	lb.	.08
Chrome Green	lb.	.36
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.36
Carbonate, Barrels	lb.	.19
Cyanide	lb.	.46
Sulphate, Barrels	lb.	.06
Copperas (Iron Sulphate, bbl.)	lb.	.02½
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.25
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	3.00
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	.26
Shellac	lb.	.75–1.00
Iron, Sulphate, see Copperas, bbl	lb.	.02½
Lead Acetate (Sugar of Lead)	lb.	.12-.13
Yellow Oxide (Litharge)	lb.	.09
Mercury Bichloride (Corrosive Sublimate)	lb.	1.05
Nickel—		
Carbonate Dry	lb.	.40
Chloride, 100 lb. lots	lb.	.27½–.40
Salts, single, bbls	lb.	.12
Salts, double, bbl	lb.	.11
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity		.25-.30
Potash, Caustic, Electrolytic 88-92% fused, drums	lb.	.07½
Potassium Bichromate, casks	lb.	.10½
Carbonate, 80-85%, casks	lb.	.06
Cyanide, 165 lb. cases, 94-96%	lb.	.60
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Official	oz.	—
Rosin, bbls.	lb.	.03½
Rouge, nickel, 100 lb. lots	lb.	.20
Silver and Gold	lb.	.60
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.08
Silver Chloride, dry	oz.	.86
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.47
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—		
Biborate, see Borax (Powdered), bbls.	lb.	.06½
Cyanide, 96 to 98%, 100 lbs.	lb.	.23
Hydrate (Caustic Soda) bbls.	lb.	.04½
Hyposulphite, kegs	lb.	.04
Nitrate, tech. bbls.	lb.	.04
Phosphate, tech., bbls.	lb.	.03¼
Silicate (Water Glass) bbls.	lb.	.02
Sulpho Cyanide	lb.	.45
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.12–.13
Sulphur (Brimstone) bbls.	lb.	.01¾
Tin Chloride, 100 lb. kegs	lb.	.32
Tripoli	lb.	.03
Verdigris, see Copper Acetate	lb.	.36
Water Glass, see Sodium Silicate, bbls.	lb.	.02½
Wax—		
Bees, white ref. bleached	lb.	.55
Yellow, No. 1	lb.	.30
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.13-.17
Chloride, 600 lb. lots	lb.	.06½
Cyanide	lb.	.40
Sulphate, bbls.	lb.	.03

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base,	39.45
14 inch, 20 ply, 64/68, cloth	base,	49.05
12 inch, 20 ply, 84/92, cloth	base,	49.85
14 inch, 20 ply, 84/92, cloth	base,	67.15
12 inch, 20 ply, 88/96, cloth	base,	55.95
14 inch, 20 ply, 88/96, cloth	base,	75.35
Sewed Buffs, per lb., bleached and unbleached	base,	.50

FELT WHEELS

		Price Per Lb. Less Than 100 Lbs.	300 Lbs. and Over
Diameter—10" to 16"	1" to 3"	2.75	2.50
" 6" 8" and over 16"	1" to 3"	2.85	2.60
" 6" to 24"	Over 3"	3.15	2.80
" 6" to 24"	½" to 1"	3.75	3.50
" 4" to 6"	¼" to 3"	4.75	Any quantity.
" Under 4"	¼" to 3"	5.35	Any quantity.

Grey Mexican or French Grey—10c. less per lb. than Spanish, above. Odd sizes, 50c. advance.